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STAPHYLOCOCCIC INFECTIONS IN DIABETES MELLITUS

WITH SPECIAL REFERENCE TO THE USE OF STAPHYLOCOCCIC TOXOID

BY JOSEPH A. GILCHRIST, B.A., M.B. AND MARY J. WILSON,

Toronto

IN 1929 we published the fact that diabetes mellitus was curable by treating the etiological factors.[1] We cited two cases and these still are cures and with normal glucose curves. Observation during the intervening years has brought out the fact that in a large number of diabetic patients we were dealing with a staphylococcic factor in practically every case of focal infection in the upper respiratory tract. In "Staphylococcic Infection in Diabetes Mellitus"[2] it was pointed out that in one case where streptococcal infection, producing an acute frontal sinusitis, was superimposed upon a chronic staphylococcal infection there was little or no change in the diabetic condition, and hence the conclusion was drawn that streptococcal infection apparently produced little change in the diabetic state. In the "Challenge of the Pancreas"[3] it was stated that in diabetes mellitus we were probably dealing with an inactivation of insulin rather than with a lack of production. Up to this time we had been slowly curing our patients by surgically removing staphylococcic focal infection. Patient No. 1[2] eventually achieved a diet of 350 grams of carbohydrate, with normal blood chemistry, but a normal glucose curve was not obtained until after tonsillectomy, leaving her still with focal infection in the gall bladder and in one antrum. Patient No. 2 in that same report, following an acute exacerbation of his staphylococcic pan-sinusitis, relapsed sufficiently to require moderately large doses of insulin.

With the discovery of staphylococcic toxoid it was felt that a most useful weapon had been found in treating the most common diabetic complication or etiological factor. During May and June of 1932, 14 diabetic patients with upper respiratory tract infection were given staphylococcic toxoid, and during the two months of treatment 10 showed improvement, 2 were stationary, and 2 showed retrogression; while three months later 8 showed improvement, 3 were stationary, and 3 showed retrogression. This work, however, was done when weather conditions were abnormally damp and cloudy. One patient showed diabetic improvement of 104 units of insulin and 31 grams of carbohydrate in 35 days. The total carbohydrate gain according to our standard[2] was 239 grams. Our conclusions from this early work were as follows. (1) Dampness affected the diabetic condition adversely through the staphylococcic infection in sinuses; (2) a staphylococcic factor was present in most of our diabetic cases; (3) clinical improvement could not be correlated with the antihæmolytic titre of the blood; (4) the six doses given were inadequate, but the results were most encouraging.

For a year supplies of staphylococcic toxoid were unobtainable and further work was not commenced until October, 1933. During that interval, certain data were brought to our attention. C. A. Mills[4] pointed out in his survey of the incidence of diabetes mellitus that in Europe there is a high diabetic rate north of the fiftieth parallel, and a low rate to the south. He also stated that regions possessing the most changeable and stimulating climate are the ones with the highest incidence of diabetes. In a private communication from Lister Brothers, of New York, who handle diabetic supplies, it was pointed out that the greatest number of their agents were to be found in the area around the Great Lakes, whereas in the middle states, par-

ticularly Arizona, the number was much smaller. The atmospheric conditions of Arizona are especially favourable for preventing and relieving sinus infection, whereas the Great Lakes region is one in which the various sinus infections are most prevalent. This confirmed our previous observations that most of our diabetic patients in this region had a greater or less infective factor in their upper respiratory tract and this was nearly always hæmolytic *S. aureus* or *albus*, and usually in pure culture.

For a number of years we have felt that the upper respiratory tract harboured infections which gave few and, often, no symptoms, and no pain, but which produced a severe toxæmia that affected the bodily functions at some distance from the site of infection. Surgical examination at the time of operation nearly always revealed polypoid degeneration of the mucous membranes, the polypi being filled with creamy yellow pus, from which hæmolytic staphylococcus was recovered, almost invariably in pure culture. Because of the polypoid nature, antral washings were negative and nasal discharge absent. Transillumination often was unreliable, while, as in dental infection, radiology failed to reveal this insidious focus of toxæmia. Because of inability to obtain routine post-mortem examination of this area it was felt that much focal infection in the sinus tract had been overlooked in the past. Numerous communications have appeared recently suggesting that cultures by the Watson Williams technique are the only reliable method of diagnosis and the reader is referred to certain enlightening papers on this subject.[5, 6, 7] By a different form of posture in the taking of sinus plates a more detailed view of the sinus mucous membranes has been obtained and this has helped considerably in our diagnosis. This is particularly true of the anterior and posterior ethmoid cells and sphenoids which can be so easily passed over in nasal examination unless acutely inflamed. This technique is being used by Dr. E. H. Shannon, at St. Michael's Hospital, Toronto, who has done the radiology for this series.

When staphylococcic toxoid became available, 55 diabetics were treated by this means. We have found that certain blood conditions have been fluctuating with the diabetic state, and hence the cases have been tested out with the following as criteria of improvement: (1) blood cholesterol (Myers and Wardell, modified); (2) white blood count, differential and non-filament count (Pepper and Farley); (3) the diabetic condition, as evidenced by glycosuria, diet and blood sugars (Shaffer Hartman). A number of the earlier diabetic patients in this series were those who at the time of operation had been shown to have staphylococcic infection in various sinuses. A second group of diabetics, however, was taken without culture and without any radiological examinations of the sinus tract. A history from the first group follows.

CASE 1

This patient, 40 years of age, is a diabetic of 17 years' duration, on a diet of carbohydrate 148, protein 111, fat 234; calories 3,142. He was one of the earliest cases to receive insulin, and the patient on whom the first insulin and respiratory quotient work was performed on February 11, 1922. At an early school age this patient was annually ill with a low grade fever for a month or six weeks during the months of March and April, and this was always associated with marked anæmia. During the spring of the year, at the ages of eighteen and nineteen, he was ill with facial paralysis. Tonsillectomy was performed in 1915. Diabetes developed about the middle of March, 1917, when patient was exposed to severe weather conditions during army life. The onset of diabetes was associated with a general upper respiratory tract infection. A right turbinal polypus was diagnosed in January, 1921, and removed. Double antral infection was diagnosed first in January, 1924. An appendectomy was performed in June, 1924, the operation having to be postponed from March because of double antral infection. Double antrotomy was performed in September, 1928. An acute right ethmoiditis was diagnosed in November, 1929, and *S. aureus hæmolyticus* was found in pure culture at this time. Because of local climatic conditions, the patient was operated on after a month's stay in Arizona, in December, 1929. Only a partial ethmoidectomy was done at this time. A local septum and partial ethmoidectomy was performed in August, 1930, when a pure culture of *S. aureus* was again discovered. A radical ethmoidectomy was done in August, 1932, with considerable improvement in both diabetic and nasal condition. During nine years this patient has been unable to work for over forty months because of sinus infection, whereas his diabetic condition has not necessitated his absence even for one day during his seventeen years' course of treatment.

This patient, during the work of 1932 with staphylococcic toxoid, showed an improvement equivalent to 32 grams of carbohydrate, despite frequent exacerbations of infection in his right ethmoid. Owing to the fact that toxoid was not available, and despite the fact of having had a radical ethmoidectomy, during the summer of 1933 he was able to average but nine days a month from May until October, and oftentimes for only a period of one or two hours a day. His inability to work during the summer months was always associated with humidity. Since starting the toxoid he has not missed one day on account of illness, despite the fact that the month of November was the wettest, with two exceptions, in the history of the Observatory, with the greatest snowfall in ninety years in the month of December, and with only some five hours of sunshine the first half of January of this year.

In this connection a most interesting observation was made during the early part of December, while the patient was still on insulin. He retired at 11.30 p.m., the sky being overcast and a damp south-east wind blowing, and fell asleep at once. At 2.10 a.m.

he awakened to find a strong north-west wind blowing, the sky clear and starry. He was unable to go to sleep again, but had no definite signs of hypoglycæmia. He worked until 3.50 a.m. when perspiration and pupillary dilatation developed, and, after taking a blood sugar and eating some food, retired at 4.15 a.m. falling asleep about 4.40. He awakened again about 6.50; his pupils normal, but he could not again get to sleep. The blood sugar taken at 3.50 a.m. gave 0.069 per cent. The next day the Meteorological Office reported that the weather conditions of the night before were almost unique. Up till midnight a warm wind laden with moisture from the Gulf of Mexico was blowing from the south-west, bringing a rapid drop in humidity. The patient's hypoglycæmia started shortly after the drop in humidity.

It was found that blood cholesterols, white blood counts, differential and non-filament count, glycosuria, and blood sugars, all increased with the humidity. This was true also in the twenty-four or forty-eight hours succeeding each dose of toxoid, and then improvement was made during the succeeding days until the next dose of toxoid. From October 22, 1933, to January 1st of this year, the patient has gradually reduced his insulin from 44 units to none and from New Year's on his diet has been increased by 16 grams of carbohydrate. For the first time since the discovery of insulin, he has been able to carry on without the hormone which saved his life in 1922. During the same period last year, with much better weather conditions, he reduced his insulin dosage by only 4 units.

This patient in previous years always dreaded his convalescence from sinus infections because of the severe hypoglycæmia which developed in the presence of moderate or severe glycosuria. It is now discovered that there is a lowering of his renal threshold for glucose during the convalescent stage. The threshold in this case has fallen from 0.170 per cent, a figure accurately established in 1922, to less than 0.080 per cent. Fasting blood sugars since the discontinuance of insulin have been correlated with urinary samples collected over a fifteen or twenty minute period of time with the following results.

The patient has excreted as high as 179 grams of glucose in twenty-four hours on the above diet, with a four-plus acetone and two-plus diacetic acid test, with normal fasting blood sugars. During this period, he has experienced all the symptoms of polydipsia, polyuria, and rapid loss of weight, but without any impairment of his ability to work, and with no mental sluggishness or physical fatigue, such as was felt during previous convalescences when an effort was made to control his glycosuria by raising his insulin. On January 11th he was found to have pus in the right ethmoid, but this in no way caused physical or mental fatigue, as it did on so many former occasions. X-ray examination on January 30th showed generalized, pan-sinusitis. Since coming off exogenous insulin, this man and other patients have had definite symptoms of hypoglycæmia produced by their endogenous insulin.

The family history of this patient is interesting. During his infancy, his mother suffered from severe neuralgia or migraine. It is now found that she has a chronic anterior ethmoiditis, which affords a pure culture of hœmolytic *S. aureus*, the same as her son. The patient's wife has a chronic anterior ethmoiditis, with chronic maxillary antrum infection and has the same organism. Of the patient's office staff of two technicians both have nasal swabs positive for the same organism, and his cook and bulldog also show the same organism in nasal and throat swabs, respectively. All these contacts, in a greater or less degree, depending on the amount of infection, have shown physical fatigue and mental lassitude. This history is but typical of many families showing the infectivity of this organism, and is the main factor

Date 1934	Hour	Per cent Humidity	Blood Sugar	Urine Sugar 15m. Spec.	Urine Sugar 24-hr.	Cholesterol	White Blood Cells	Non-filament Count	Polymorphonuclears	Diet C.	Diet P.	Diet F.	Insulin Daily Dosage	
7/1	Fast.	80	0.095	3.0	88.0	146	11,400	33	76	148	111	234	0	
8/1	"	71	0.168	3.4	98.7	152	10,000	33	79				0	
9/1	"	77	0.157	3.9	126.0	162	11,300	28	78				0	
	Noon		0.151											
	7 p.m.		0.081	4.2										
	11 p.m.		0.108											
10/1	Fast.	67	0.081	3.0	140.4	157							0	Acute right ethmoiditis. Non-protein nitrogen, 37. Plasma pH. 7.35; CO_2 combining power, 54.1 vols. per cent.
	5 p.m.		0.122											
11/1	Fast.	76	0.181	4.5	159.6	149	13,050	40	86				0	
	11 a.m.		0.321											
	12.30 p.m.		0.293	4.2										
12/1	Fast.	84	0.127	5.7	92.4	217	12,150	41	84				0	
13/1	"	87	0.158	3.8	89.4	197								
14/1	"	77	0.154	3.65	116.0	162	12,000	45	92				0	
15/1	"	85	0.132	3.0	120.0	150	12,050							
16/1	"	77	0.119	3.6	115.9	148	14,700							
17/1	"	62	0.108	4.0	138.2		9,150	38	81					
25/1	"	70	0.105	2.7		208	14,600	45	91	164	109	119		Generalized acute pan-sinusitis.
26/1	"	72	0.119	3.0		285	10,400	39	83					Double ethmoid.
27/1	"	79	0.200	3.0		341	10,250	47	86					Double antrum.
28/1	"	87	0.230	3.6		341	14,700	41	87					Double frontal.
29/1	"	58	0.134	3.0	134.3	333	12,050	50	75	219	114	126	10	Plasma, pH. 7.2; CO_2 combining power, 44.4 vols. per cent.
30/1	"		0.151	0.8	68.4	326	13,200	32	83				15	
31/1	"		0.145	3.4	77.7	210	10,550	47	86				20	
2/2														CO_2 combining power, 68.1 vols. per cent.

in explaining why diabetes sometimes occurs in families and is also conjugal. The exposure to the same staphylococcic infection and to the same mode of living, in our estimation, is the reason for the familial incidence of diabetes, and not a hereditary factor.

CASE 2

Another case, a girl of 15, who has just recently developed a mild diabetes, and who is just recovering from an acute maxillary sinusitis and anterior ethmoiditis, shows this same lowered renal threshold for glucose, having 0.4 per cent of urinary sugar in a 15-minute sample taken with a fasting blood sugar of 0.093 per cent. This lowering of the renal threshold probably is the explanation of a number of our transient glycosurias which have been so obscured by the misnomers of alimentary or benign glycosurias.

The next case was not investigated bacteriologically or radiologically until after the eleventh dose of toxoid.

CASE 3

A woman, aged 78, who, because of her age, was not cultured from antral lavage, was given staphylococcic toxoid, because twenty-four hours' urinary output showed 16.8 grams of sugar. She was desirous of avoiding insulin therapy, and after 11 doses of toxoid, extending over 10 weeks, her diet has been increased in carbohydrate from 69 to 111 and in protein from 58 to 77. She became sugar-free as the blood sugars fell, and, while she had some 16.0 grams of urinary sugar, this was due to the lowered renal threshold for glucose. Non-protein nitrogen values have fallen from 44.4 to 30.5. After 10 weeks, nasal cultures and sinus plates were taken, and they revealed infection in both ethmoids and in the right antrum, with a culture positive for hæmolytic *S. aureus*.

CASE 4

This patient reported in a state of severe acidosis and pre-coma. She became aglycosuric with 72 units of insulin. Toxoid was not then available. Her basal metabolic rate when the diabetes was controlled was minus 10 per cent, the patient being 30 pounds over weight and on a diet of 1,664 calories. She was placed on thyroid, one grain daily, but in one month had reduced only 2½ pounds, in spite of having had a tonsillectomy during that time. Tonsillectomy and right antrotomy were performed and *S. aureus hæmolyticus* was obtained from the right antrum. After the parts were healed, the patient still being on one grain of thyroid daily and on the same diet, her basal metabolic rate checked at minus 17 per cent, which showed that the staphylococcic toxin had increased the metabolic rate without increasing the thyroid activity, which would have been evidenced by loss of weight. She was placed upon three grains of thyroid and immediately began to lose one or two pounds a week. Within three weeks of starting insulin she dropped 72 units of insulin and dispensed with it entirely, and since that date has had carbohydrate increases amounting to 34 grams.

For some reason, then unknown, towards the end of November, cultures obtained from staphylococcic carriers suddenly became negative. It had been found previously that slight traces of sodium bicarbonate in antral cultures, taken by the Watson Williams' technique, inactivated the staphylococcic organism, and no growth was obtained unless the culture was planted within a very short time. It has also been known for some time that alkali-producing diets increased insulin activity. The pH of the culture media, when no growth was obtained, was found to be 7.8. When the pH of the media was lowered to the pH of the blood in diabetic coma, which is 7.1, a copious growth of staphylococcus was produced. Walbum[8] reports that the optimum pH for staphylococcic growth is 6.5; hence the use of alkaline therapy in diabetic coma has probably been helpful in inactivating the organisms the toxæmia from which produces coma.

The sinus infections caused by staphylococcus produce a tremendous mental depression and inability to concentrate. Three of our patients with this sinus complex have committed suicide. There is marked tachycardia (120 - 140), very little elevation in temperature, 99 - 100°, but marked physical and mental fatigue. These symptoms are more marked in the morning, because of the lack of drainage during the night. The mental condition improves throughout the afternoon, and by night is such that they invariably do not wish to retire, because they are mentally alert and dread the recurrence of the succeeding morning's depression. It was noticed particularly that patients on toxoid treatment had more physical energy and marked improvement in their mental abilities, with complete cure of their mental depression and inability to concentrate.

Three diabetic patients with staphylococcus in their sinuses, who have had pyelitis and cystitis, were found to have pure cultures of hæmolytic staphylococcus aureus in the urine on catheter sample. Treatment with urotropin and an acid diet and medication to keep the pH of the urine less than 5.5, as advised by Helmholtz,[9] only increased the symptoms, while the use of alkalies greatly improved and cured one case. During the negative phase following toxoid injection, one of the patients regularly had a shower of pus cells, while later, in the positive phase, the urine would only contain one or two pus cells in the centrifuged specimen.

An untreated diabetic, with gangrene of the foot, showed staphylococcus in pure culture from both nose and foot.

One case of diabetic cataract, with severe retinal hæmorrhage, who was completely blind, now has 3/40 vision, or an improvement of approximately 30 per cent. As the lens and

retinal condition remain unchanged, the only explanation lies in the increased sensitivity of the optic nerve owing to toxæmia being lessened by means of toxoid. One other case has had similar improvement.

In reference 2 we stated that 57 per cent of our diabetics had chronic cholecystitis. We have noticed over a period of years that gastro-intestinal symptoms associated with this focal infection coincided with acute exacerbations of sinusitis. At first we were dependent for nasal cultures on antral or ethmoidal washings by means of the Watson Williams' technique, but cultures taken aseptically from the floor of the nose and from under the inferior turbinate recently proved equally satisfactory to ourselves and much more so to the patients.

Insulin, which has saved so many lives by controlling hyperglycæmia and glycosuria, nevertheless failed to produce cures, as it did not treat the cause. Staphylococcic toxoid, because it reduces the toxæmia which is producing diabetic hyperglycæmia, is not only restoring blood sugars to normal but is uniformly doing the same with other abnormalities which are present in the diabetic state. Patient No. 1, who is on an excessively high fat diet, for experimental purposes, as well as others on low fat diets, and even non-diabetic patients on a normal diet, shows lowering of blood cholesterol to normal limits by the use of toxoid. The cholesterol values previous to toxoid therapy have been fluctuating with weather conditions in the three types of cases cited above, and patient No. 1, despite his long diabetic regime, shows no vascular change in the dorsalis pedis nor is any abnormality obtained by fluoroscopic, electrocardiagraphic or physical examination in his cardiovascular system. Thyroid abnormalities tend to improve with this therapy, and various forms of staphylococcic infections, such as skin eruptions, and digestive disorders are improving.

Abnormalities in blood chemistry have been returned to normal, such as the non-protein nitrogen and the hæmoglobin, permitting the discontinuance of iron in the secondary anæmias. It would appear that the use of insulin in two or three doses daily may be obviated by substituting toxoid once in five days or once weekly.

Because of unpleasantly severe reactions in the early doses we have slightly modified the instructions issued by the Connaught Laboratories, as follows. Use 0.025 c.c. for the first dose instead of 0.05 c.c. The early doses give much less local reaction if diluted with about 0.5 c.c. of sterile normal saline. If the toxoid is diluted as advised it is necessary to take into consideration the amount of toxoid contained in the dead space of the syringe (the shank and needle). This amount, which may be as much as 0.075 c.c., is drawn into the syringe with the saline, and must be taken into account. It should be measured, and a sufficient amount of the diluted toxoid discarded, so that only an amount equivalent to the 0.025 c.c. desired, is given. Most patients experience the discomfort of the reaction 16 to 20 hours after the injection. In a few, however, it may start within a few hours or not until after 24 hours or longer. The time of injection should be regulated so that the uncomfortable stage may be easily passed during sleep. For business people we have found it most satisfactory to give toxoid only weekly, usually early on Saturday morning, and then the reaction does not begin until late evening. The height of it then comes about 3 a.m. on Sunday and is past by the time the patient gets up. Even with severe reactions there is seldom any negative phase beyond Sunday afternoon. This interferes very little with pleasure, and not at all with business.

Many and varied are the symptoms reported during the negative phase. Fever, headache, general aching, pains in the joints, abdominal discomfort, sore throat, dizziness, præcordial pain, and outbreak of acne, have all been frequently reported. The dizziness appears to be related to low blood-sugar level and is relieved by eating. Care should be taken to include some protein in the food taken, as the eating of carbohydrate only will stimulate insulin production and later cause a worse attack of dizziness. The præcordial pain also appears to be related to low-blood levels. Almost all patients report worse reactions during wet weather. In some cases no improvement is noted until after the 8th or 9th dose, when it may be rapid. In diabetics on insulin it is necessary to be on the watch for the symptoms of hypoglycæmia, and to cut the insulin, even if patient is showing sugar, since this may be due to a lowered renal threshold for glucose. We have found the white blood count with non-filament differential count the most universally useful single means of gauging improvement.

In a number of cases we have continued in-

creasing doses beyond those advised by the Connaught Laboratories, up to 1 c.c. of toxoid with very good effect. In some patients we intend to continue treatment with toxoid until the warm weather returns. This depends entirely on the individual clinical picture—the amount of focal infection, the weather, and the progress of the case.

CONCLUSIONS

1. Diabetic patients in this region treated with staphylococcic toxoid show definite improvement, in spite of adverse weather conditions, in all tests which were used as criteria. This is the first time that we have been able to note this in the winter months. We have been able to substitute various daily doses of insulin by a weekly dose of staphylococcic toxoid.

2. The diabetic cases on insulin have all shown a reduction of insulin dosage, the rate of fall being dependent on the amount of focal infection and dampness.

3. We are now convinced that in most diabetics in this region we are dealing with a staphylococcic factor, and that by using toxoid we are attacking the cause. We have been afraid to use the antitoxin because of the tremendous alterations that may occur in the diabetic state.

4. We are convinced that staphylococcic toxin increases the basal metabolic rate.

Our object in publishing this preliminary report is to give to the medical profession our experience with staphylococcic toxoid, so that it can be used with their diabetic patients during the forthcoming rainy Spring weather, when they need it most. This paper is to be more fully amplified in the near future when meteorological data, with special reference to the humidity, are available.

We wish to thank the Provincial Board of Health for the bacteriological work included in this paper. We gratefully acknowledge the help given to us in this and other papers by the counsel of Dr. John T. Fotheringham.

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THE SYNDROME OF THE POSTERIOR INFERIOR CEREBELLAR ARTERY*

(WITH TWO ILLUSTRATIVE CASES)

BY COLIN RUSSEL, M.D., F.R.C.P.(C.) AND GEORGE W. STAVRAKY, M.D.,

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THE symptoms of occlusion of the posterior inferior cerebellar artery have been well described and are at present readily recognized. This condition is otherwise referred to as the "lateral syndrome of the medulla" and the "retro-olivary bulbar paralysis or syndrome."

The first case of occlusion of the posterior inferior cerebellar artery with autopsy was described by Senator[1] in 1881. Remak[2] described a similar clinical case the same year. In 1883 Senator[3] described another and, later, analogous cases began to appear periodically in the literature, and the syndrome, after the description of Wallenberg[4] in 1895, has received full recognition. In 1923 Margaret Gerard,[5] in a very painstaking survey, was able to collect from the literature 39 cases of this condition. In 1925 Stopford[6] added 5 to the list; 8 cases more were described by Riley[7] and 6 by Merrit and Finland[8] in 1930. We have been able to find records of 10 more reported by Gordinier,[9] Thomson,[10] Popov,[11] Hasiguchi[12] and others, making a total of 68. Good bibliographies are given by Gerard, Stopford, Thomson, Merrit and Finland, and it therefore seems unnecessary to give a detailed account of the literature.

ANATOMY OF THE POSTERIOR INFERIOR CEREBELLAR ARTERY

The posterior inferior cerebellar arteries are branches of the vertebrals, from which they divide at the middle of the medulla and pass

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outward and backward over the lateral surface of the medulla till they reach the restiform body. There they turn upwards and travel along the dorsal surface of the inferior cerebellar peduncle (restiform body), and when the latter enters the cerebellum they pass on to its postero-inferior surface (Gordinier[13]).

The ascending limb of the artery, according to the careful studies of Hun and Van Gieson,[14] Spiller,[15, 16] Thomas,[17, 18] and Stopford,[19] provides a number of branches to the medulla, which enter the latter in the region of the postero-lateral sulcus.

The anterior and median parts of the medulla receive their blood supply from the branches of the anterior spinal arteries; the olives, from the branches of the vertebrals. The cerebellum in case of occlusion of one posterior inferior cerebellar artery is not affected, on account of the anastomoses between both the arteries with each other and with the superior and middle cerebellar arteries; so it happens that the area of degeneration in cases of occlusion of the inferior posterior cerebellar artery is limited to the postero-lateral part of the medulla at the level of the olives, and occasionally it spreads higher up and to the pons.

Stopford, who has done 22 injections of the posterior inferior cerebellar artery, has described four variations in its distribution, giving a very excellent sketch of the anatomical structures involved in each case. He comes to the conclusion that the area most commonly involved is that of the restiform body, descending nucleus of the fifth nerve, nucleus ambiguus and the spino-thalamic tract. Also the rubrospinal tract and the descending sympathetic fibres can be damaged as they pass through that region of the medulla. However, in some instances, as demonstrated by Stopford's injection method and also supported by clinical data, the posterior inferior cerebellar artery supplies only the lateral part of the medulla. Occlusion of the artery in this type of case leaves the restiform body, the rubrospinal tract, and the spinal nucleus of the fifth nerve intact, damaging instead the crossed ventral trigeminal bundle which carries pain and temperature fibres from the opposite side of the face, the nucleus ambiguus, spinothalamic tract, and the sympathetic fibres being invariably involved.

CLINICAL DATA

Summarized very briefly, the symptom-complex of occlusion of the posterior inferior cerebellar artery consists of:—

1. Hemianalgesia and thermal hemianæsthesia alternans, the distribution being most often over the face on the side of the lesion and over the body contralaterally.

2. Laryngo-velo-palatine palsy, which is referred to in connection with the hemianæsthesia as the "syndrome of Avellis," and is due to the involvement of the nucleus ambiguus on the side of the lesion.

3. Paralysis of the cervical sympathetic nerve, causing a Horner-Claude Bernard syndrome on the side of the lesion.

4. Some cerebellar signs usually also on the side of the lesion.

The condition is very seldom accompanied by any disturbance of consciousness. Besides these classical features some other disturbances may also take place. As discussed by Spiller,[20] Gordinier and Gerard, Ménière's syndrome of vertigo, vomiting, and deafness on the side of the lesion may be present. Paralysis of the muscles of deglutition, facial nerve paralysis, transitory weakness of the tongue, absence of sweating over half of the face, persistent hiccoughing, alterations in the pulse, and other disturbances have been recorded. It has been already pointed out that the trigeminal anæsthesia may also vary in distribution, sometimes being crossed, as will be found in one of the presented cases.

If the clinical picture of the condition is so typical that it presents but little difficulty in diagnosis, many fine points in the anatomy and physiology of the involved region of the medulla are not yet clear. For this reason further study of such clinical cases seems to be of value. The two cases which are reported here each show an obviously individual variation in the area of the medulla affected, and form an interesting contribution to the knowledge of the pathways of trigeminal sensibility.

CASE 1

Z. St. Y., male, aged 50, was admitted to the medical wards of the Royal Victoria Hospital on March 14, 1933. He had been attending the Out-Patient Clinic for diabetes mellitus on March 8th and 9th.

History of present illness.—On March 9th, about five p.m., he was suddenly seized with a severe pain in the left temporal region which radiated behind the left ear and down the left side of the throat. At the

same time he was intensely dizzy and covered his eyes with his hands. He broke out into a profuse and general perspiration, but did not lose consciousness. On recovering somewhat he found that he could not phonate, but could only speak in a whisper, and when given a drink the liquid regurgitated through his nose. That same night he noticed that the right side of the body was colder than the left, and he was unable to distinguish between heat and cold on the right side. The inability to do so still remains; he noticed this when washing his hands in cold water, which would feel quite natural to the left hand, but to the right it would feel warm; the same was true for the leg and the right side of the body, including the face. He did not notice any weakness of the arms or legs.

On Friday, March 10th, at two a.m., some small black blood clots came from the left side of his nose; this has not recurred since. His ability to swallow liquids without regurgitation improved in the interval, and his voice, though still somewhat hoarse, was much stronger.

He had had an abnormal thirst and polyuria for the past five years. He was put on a diet for diabetes two years ago, but did not keep to it on account of its inconvenience. He had been attending the clinic for diabetes since January of this year.

Past and personal history.—The patient had always had fair health, apart from smallpox at the age of 23 and an attack of what was called grippe at the age of 26, when his legs became swollen and remained so for fifteen days. This has not recurred since. He used to drink three quarts of beer daily, sometimes more, but not lately. His family history presented nothing of interest. Venereal disease was denied.

General physical examination. — On examination, apart from the diabetes, the chief interest was in the nervous system, a small rectal fistula being the only other pathological finding.

Neurological examination.—The patient was very intelligent and cooperative.

Cranial nerves:—

2nd.—The fundi were normal.

3rd, 4th, 6th.—The left palpebral fissure was narrower than the right and the left pupil smaller; both reacted to light and on accommodation. Extra-ocular movements were unimpaired.

5th.—The motor branch was uninvolved, the muscles of mastication functioning perfectly on both sides. Sensibility to pain, heat and cold was lost on the right side of the face; tactile sensibility, as tested by a wisp of absorbent cotton and a hair, was not affected on either side of the face. The patient also recognized numbers drawn with a pencil on either cheek equally well. The corneal reflex was present in both eyes, though diminished in the left one.

7th.—There was no asymmetry of the face, either on voluntary or emotional movement.

8th.—The patient could hear the ticking of a watch normally and at an equal distance from each ear.

9th, 10th, 11th.—There was paralysis of the soft palate on the left side. The uvula was pulled up and to the right. Fluids were still somewhat apt to be regurgitated through the nose. There was some hoarseness of the voice and Dr. G. E. Tremble reported that there was paralysis of the left vocal cord. This cord was fixed in the cadaveric position. The right cord moved across the midline on phonation, so that the voice was not much affected.

12th.—The tongue was protruded in the midline. No tremor or atrophy was detected.

The examination of the trunk and extremities showed no disturbance of the motor system. Strength, tone and coordination were perfect.

The sensory system on the whole right side of the body showed loss to pain and thermal sensibility; sensation over the face has already been noted. Tactile sensibility and sense of position were unaffected. There was no difference in two-point sensibility anywhere.

Reflexes.—All tendon jerks seemed somewhat diminished, as is frequently the case in diabetes. The right knee-jerk was slightly more active than the left on reinforcement. The plantars were flexion, both right and left; the right was not as easily obtained as the left. The abdominals were not obtained. The visceral reflexes were not affected.

The cerebrospinal fluid showed an initial pressure of 124 millimetres of water, was clear, and contained 2 lymphocytes per cubic millimetre. Pandy's test was negative for globulin. The total proteins measured 82 milligrams per cent.

The blood and cerebrospinal fluid Wassermann reactions were negative.

Examination of the heart and electrocardiograms showed no evidence of involvement of the cardio-inhibitory fibres.

On March 28th, two weeks after admission, further examination of sensibility brought forth the same results as at the first examination, except that the patient had now regained sensibility to pinprick over the mandibular branch of the trigeminal nerve and over the right side of the nose. Sensibility over these areas was now only slightly diminished as compared with the normal side.

On May 19th sensibility had returned over the whole right side of the face, although it was still considerably diminished over the right side of the body and limbs. A complete absence of sweating over the left half of the face had been observed by the patient during very hot weather. The patient gave this information spontaneously.

CASE 2

A.L., aged 38, a farmer, was admitted to Dr. Penfield's Neurological Service on March 20, 1933, with the complaints of impaired vision and staggering gait.

History of present illness.—In January, 1933, the patient, who had up to that time been enjoying good health, noticed that his voice had become hoarse, thick, and of a lower range. This change in voice came very suddenly and was not associated with bronchitis, sore throat or a febrile condition of any kind. It persisted for about eight days, after which time it began to improve gradually, but never cleared completely.

In the beginning of February, 1933, the patient had an acute attack of dizziness, nausea and vomiting, which came on suddenly and lasted for some time. It was diagnosed by his local physician as indigestion. Following this there were no special complaints, except that the patient seemed to feel quite weak and remained about the house for two weeks. When he began to go out again he noticed a drooping of the left eyelid, and he thinks that his vision became less accurate for short distances. He experienced some pain in the left side of the face in the region of the upper lip and also in both legs, more so in the left than in the right. He seemed to walk like a drunken man, constantly requiring the use of a stick.

A week later he went to a hospital in Quebec, where he was admitted on February 23rd. There three successive lumbar punctures were performed, with the following findings:— February 25th—lumbar puncture in the sitting position. The fluid was clear; 23 c.c. were removed. The initial pressure varied between 700 and 760 mm. of water; final—610 mm. of water. Albumin, urea, glucose and chlorides were studied, with normal findings. Leucocytes—6.9 per c.mm.; bacteriological examination, sterile. The Kahn and Wassermann tests were both negative. Two successive lumbar punctures were almost identical.

After the lumbar punctures the pains in his face and legs seemed to disappear, though the other symptoms

persisted. On March 19th the patient was transferred to the Neurosurgical Service of the Royal Victoria Hospital.

There was no history available of any loss of consciousness, difficulty of swallowing or choking. There had been no blurring of vision or diplopia at any time.

Past and personal history.—The patient had been healthy, except for the attack of bronchitis which occurred two years ago, at which time he spent three weeks in hospital. He denied venereal disease; had been married for three years; had no children. His habits of life were moderate. Both parents died in old age of vascular accidents involving the speech.

General physical examination.—The patient was an obese, heavily built man. The heart was slightly enlarged, the sounds regular and of good quality; no murmurs were detected. The pulse 80 per minute; blood pressure 130/80. Examination was otherwise negative, except for the neurological findings.

Neurological examination.—The patient was clear mentally, well oriented and cooperative.

Cranial nerves:—

2nd.—Visual acuity was normal; fields full; fundi normal.

3rd, 4th, 6th.—Pupils, round and regular. The left pupil was smaller than the right (3/10 of a cm. as compared with 5/10 on the opposite side). Left palpebral fissure was narrower than the right and the upper lid drooped somewhat. The extra-ocular movements of the left eye were normal, but there seemed to be slight impairment of the lateral movements of the right eye. During the ophthalmoscopic examination nystagmoid movements of the discs were observed.

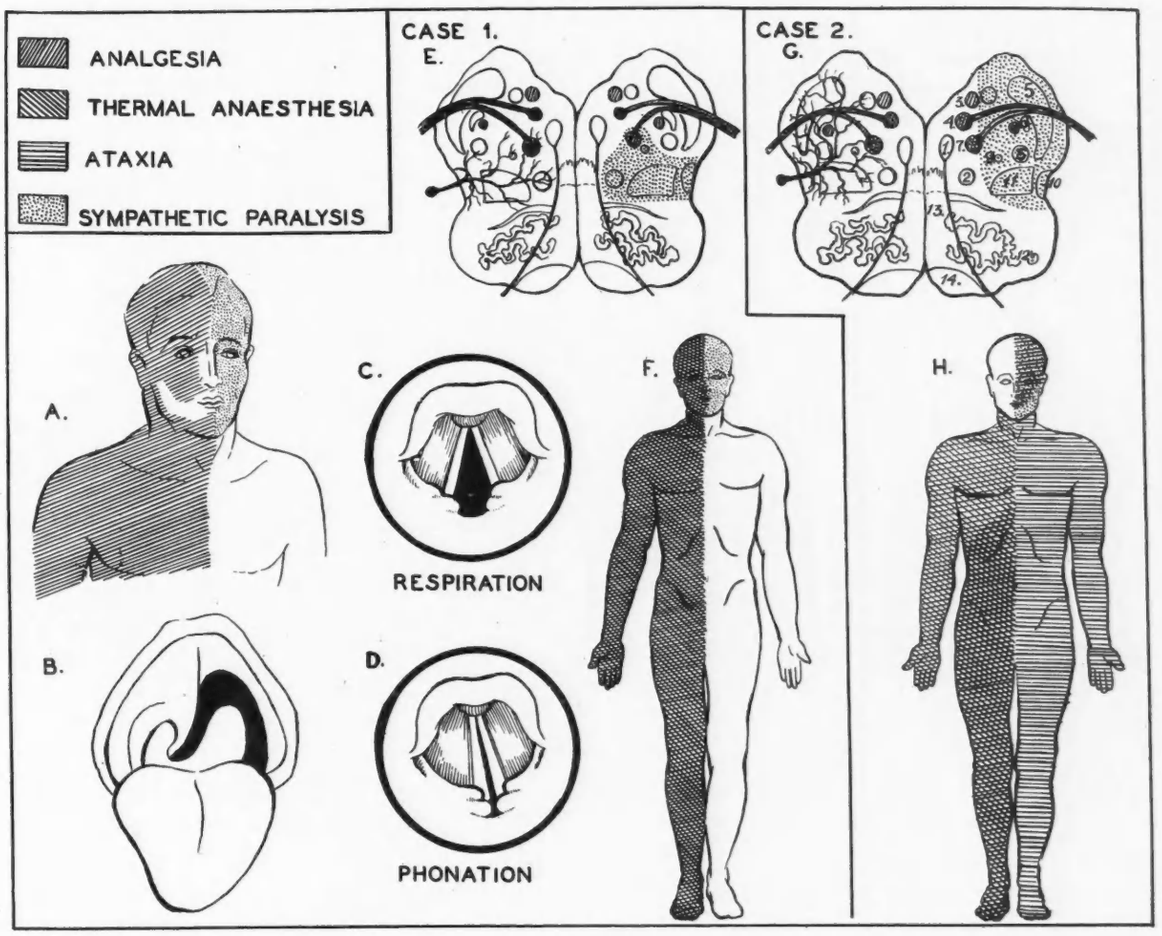

FIG. 1

A. Intermediary stage of recovery of sensation in the face.
B. Paralysis of the soft palate and uvula.
C and D. Paralysis of the left vocal chord.
E and G. Diagrammatic drawing of the cross section of the medulla approximately at the level of the upper third of the olives, showing the possible distribution of the branches of the posterior inferior cerebellar artery in the medulla and the corresponding lesions in the two cases due to its occlusion.
F and H. Diagram showing the distribution of the sensory loss, sympathetic paralysis, and ataxia in each case.

1. Nucleus of the nervus hypoglossus (at a higher level its place is taken by the nucleus of the facial nerve). 2. Ventral secondary tract of the trigeminal nerve carrying ascending fibres for pain and thermal sensibility from the opposite side of the face. (The dorsal secondary tract, carrying tactile sensibility, takes its origin at a higher level and is absent in this section). 3. Nucleus and tract of the vestibular nerve. 4. Nucleus dorsalis vagi and glossopharyngei. 5. Corpus restiforme. 6. Descending nucleus and tract of the trigeminal nerve also known as the spinal nucleus. (This is the cell station for pain and temperature fibres on their way to the opposite side). 7. Nucleus ambiguus. 8. Rubro-spinal tract. 9. Sympathetic fibres. 10. Ventral spino-cerebellar tract. 11. Lateral spinothalamic tract. 12. Olive. 13. Mesial lemniscus. 14. Pyramidal tract.

5th.—Motor fifth normal on both sides. Sensation to cotton wool normal over all divisions, whereas the sensation to pinprick was absent over the distribution of the first and second divisions on the left side of the face, leaving the mandibular branch and ear as well as the right half of the face intact. The corneal reflex was active in the right eye but absent in the left.

7th.—Symmetrical.

8th.—Normal acuity on both sides. Air conduction greater than bone conduction.

9th, 10th, 11th.—The uvula seemed to move in the midline; if there was any asymmetry it was very slight. The voice was low, of a dull timbre and according to the patient had changed markedly. The gag reflex was absent.

12th.—The tongue was protruded in the midline; some fine fibrillary twitchings were present; no gross atrophy detected.

Reflexes.—The tendon-jerks were symmetrical, the knee-jerks accentuated on both sides. Plantars—flexion; abdominals — present and equal; cremasterics — active bilaterally.

There was no disturbance of muscular power, though the tone was diminished in the left arm and leg. The rebound control was absent in the left extremities, and other coordination tests were also less accurate on the left side both in the arm and leg.

His gait was markedly impaired, the patient being unable to walk without his cane, and having a tendency to stagger towards the left side.

The sensory system showed a loss of pain and thermal sensibility over the whole right side of the body up to the neck. Whereas the thermal sensibility was almost completely gone, sensation to pinprick was only reduced, more markedly so in the lower extremity. There was also some paræsthesia present. The patient stated that he had recently noticed that pinching of the skin over the right thigh was more painful than on the left and was accompanied by a tingling sensation. The anæsthesia over the left side of the face has been mentioned before.

Tactile sensibility was normal throughout. Vibratory, sense of position, two-point sense, figure-writing and stereognosis were also unimpaired.

On March 23rd the patient was discharged, with his condition unchanged, and he returned home.

DISCUSSION

The two cases here described, being in our opinion cases of occlusion of the posterior inferior cerebellar artery, present in many respects striking variations and can be placed in Stopford's most opposing groups. The common factors in both were: (1) the analgesia and thermal anæsthesia over the right half of the trunk and extremities; (2) a left-sided Horner syndrome; (3) a change of voice at the onset of the disease. But whereas the first patient had an impairment of sensibility to pain and temperature over the side of the face opposite to the lesion, the second had the anæsthesia over the homolateral side. In the first patient the palate, uvula and vocal cords presented striking abnormalities; in the second they were almost normal. In the first patient the cerebellar signs were absent, except for vertigo at the onset; in the second they presented a prominent feature. The patient staggered to the left side and could not walk without a cane. Lastly, in the first patient the corneal reflex on the anæsthetic side of the face was present and active; in the second patient it was absent on the anæsthetic side.

The loss of pain and temperature sensibility, being the constant feature of this condition, needs little explanation. It is caused by the destruction of the spino-thalamic tract at about the mid-olivary level of the medulla. Horner's syndrome is also a frequent finding. The older authors ascribed it to the destruction of the sympathetic centre in the bulb, but after the investigations of Karplus and Kreidl,[21] Beatty, Brow and Long,[22] and others it is generally accepted that the sympathetic fibres which descend from the hypothalamus between the nucleus ambiguus and the spino-thalamic tract are involved.

Concerning the trigeminal anæsthesia, it has been pointed out by Brun[23] and later by Stopford[24] that the occlusion of the posterior inferior cerebellar artery destroys the spinal nucleus of the fifth nerve, as the artery branches in the bulbar part of the brain stem, the main sensory nucleus in the pons remaining unaffected.

As in the majority of clinical cases there is a disturbance only of pain and temperature sensibility, these authors assume that the spinal nucleus must be associated with pain and temperature sense and the pontine with touch. Gerard and others reached the same conclusion in the study of animals. These investigators also conclude that the fibres from the first or ophthalmic branch of the fifth nerve descend to the lowest part of the spinal nucleus; those from the second or maxillary branch occupy the middle; and those from the mandibular division enter the upper third of the nucleus.

From the spinal nucleus fibres of the second order cross almost transversely to the opposite side, forming a bundle which is situated medially to the spino-thalamic tract, and they ascend in close relationship to it in the retro-olivary region. This bundle is known as the ventral ascending trigeminal tract.

From the pontine nucleus fibres cross the midline chiefly in the pons and ascend, according to Rasmussen,[25] in the dorsal ascending trigeminal tract, carrying tactile sensibility.

On the whole, the course of these ascending fibres has not yet been definitely traced in the brain stem and mid-brain, and accurate knowledge is lacking.

In clinical cases, most commonly, the descending tract and spinal trigeminal nucleus are destroyed by the lesion in question, causing an analgesia and thermal anæsthesia of the face on the side of the lesion, and as the spino-thalamic tract is crossed an alternate hemianalgesia and thermal anæsthesia are produced. Sometimes, however, the artery branches in such a manner that in its occlusion the trigeminal nucleus of the same side is spared and the crossed trigeminal tract is damaged instead (Fig. 1). In these cases, as seen in the diagrams, the anæsthesia over the face will be on the same side as over the body. Stopford found in the literature five cases of this kind and we came across two more, ours making the eighth case in this series. In our second case the trigeminal anæsthesia was on the side of the lesion, indicating that the trigeminal nucleus was involved, and as it spreads only over the first and second divisions, leaving the mandibular branch free, it coincided very well with the view that the lower two-thirds of the spinal nucleus receive fibres from the upper two-thirds of the face.

It is of interest that when the trigeminal anæsthesia in Case 1 began to clear up sensation was first noted around the angle of the mouth, gradually spreading over the whole mandibular branch. Next was noted sensation on the side of the nose, later returning over the whole face. In other words, the restoration of sensation is in agreement with the anatomical arrangement of the sensory portion of the trigeminal nerve tract.

The variation in the corneal reflexes also seems worth mentioning. On the grounds of histological evidence (Schafer[26]) the corneal reflex is assumed to be carried by trigeminal pain paths to the nucleus of the facial nerve. This view was supported by the fact that in cases where the lower two-thirds of the spinal nucleus are involved the corneal reflex disappears. This is also true for our second case; but in the first case, in which apparently the whole ascending tract of the fifth nerve for pain and temperature sensibility was involved, the corneal reflex was present.

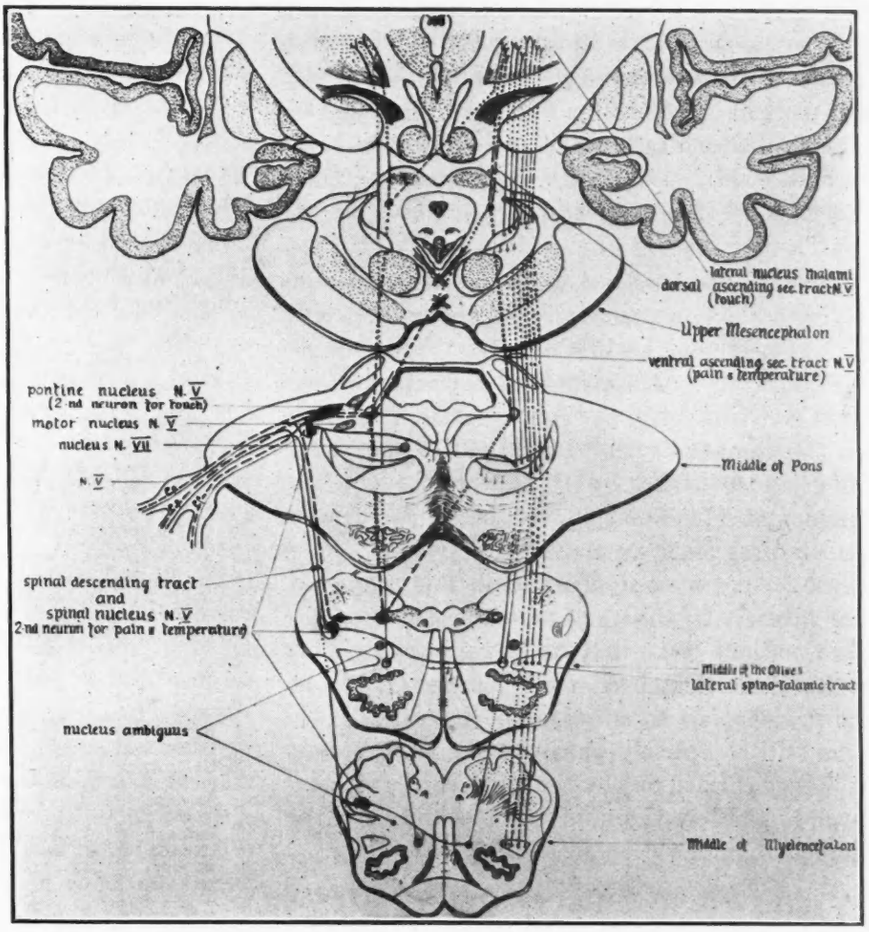
lateral nucleus thalami
dorsal ascending sec. tract N.V (touch)
Upper Mesencephalon
ventral ascending sec. tract N.V (pain & temperature)
pontine nucleus N.V (2nd neuron for touch)
motor nucleus N.V
nucleus N. VII
N.V
Middle of Pons
spinal descending tract and spinal nucleus N.V 2nd neuron for pain & temperature
Middle of the Olives
lateral spino-talamic tract
nucleus ambiguus
Middle of Myelencephalon

FIG. 2.—PAIN AND TEMPERATURE SENSIBILITY (a modified schema of Rasmussen)
Schematical representation of the three divisions of the trigeminal nerve.
At the middle of myelencephalon—crossing of the ophthalmic division after a cell break in the lower part of spinal nucleus.
At the mid-olivary level—crossing of maxillary division.
At the mid-pontine level—crossing of the mandibular division.
Note the uncrossed collaterals which are probably responsible for the corneal reflex.
————Trigeminal pain and temperature paths.
– – – – – Trigeminal touch paths.
–.–.–.–. Spino-thalamic pain and temperature paths (from trunk and extremities).
‘ ‘ ‘ ‘ ‘ ‘ Deep sensibility and touch—paths not drawn in completely.

In two cases of Müller's,[27] with a similar distribution of anæsthesia, the corneal reflex on the side of the anæsthesia was also active, but diminished on the opposite side of the face. This makes it probable that the paths for the corneal reflex travel upwards on the same side and do not cross with the rest of the pain and temperature fibres.

The reason for the variation in cerebellar signs is easily understood when one considers the variation in the distribution of the branches of the posterior inferior cerebellar artery in the medulla, as shown by Stopford. It can be seen also from the schematic drawing of the probable location of the lesions in our two cases. In the first case the restiform body and the rubrospinal tract, as well as the olivary connections, remain intact and the lesion is situated more anteriorly, catching the crossed trigeminal fibres instead. In the second case the branches of the involved artery probably reached more posteriorly, impairing the restiform body, the rubrospinal tract and olivary paths.

Next to hemianæsthesia laryngo-velo-palatine palsy is the most common disturbance met with in the occlusion of the posterior inferior cerebellar artery. According to Zachartschenko[28] it is met with in 86 per cent of cases and is due to the damage of the motor nuclei of the ninth and tenth nerves, particularly the nucleus ambiguus. It is one of the important factors in the prognosis, as inability to swallow is the most frequent cause of death in this condition. Of interest is the fact that the voice in the first patient recovered quite rapidly and was quite clear, though of a dull character, but on laryngoscopic examination the left vocal cord was still completely paralyzed and the phonation was carried out by the right cord swinging over to the left side and compensating for the defect of innervation in the left one.

SUMMARY

1. Two cases of occlusion of the posterior inferior cerebellar artery have been presented and the anatomical location of the lesion and symptomatology discussed.

2. The cases presented certain individual variations, the cause of this being attributed to the variability of distribution of the involved artery.

3. The anatomical conception of Brun, Gerard and Stopford as to the trigeminal anatomy is supported, namely, that the pontine nucleus of the fifth nerve receives touch fibres, whereas the descending spinal nucleus is responsible for the pain and thermal sensibility. The view that the ophthalmic division of the fifth nerve descends to the lowest part of the spinal nucleus, the maxillary occupies the middle third, and the mandibular carries its pain and temperature fibres to the upper third of the spinal nucleus, is also in accordance with the reported cases.

4. The corneal reflex has been studied, and the fact is stressed that the descending fibres from the cornea reach the facial nerve nucleus on the same side. Therefore, in cases of crossed trigeminal anæsthesia the corneal reflex remains preserved on the anæsthetic side and is diminished on the side of the lesion.

5. The variability of the involvement of the vagal and glossopharyngeal nuclei has received some consideration on account of the importance of the amount of impairment of swallowing for the prognosis. The mechanism of phonation has been discussed.

In conclusion our thanks are due to Dr. Wilder Penfield for his kind permission to publish one of these cases.

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BILIRUBIN FORMATION AND THE RETICULO-ENDOTHELIAL SYSTEM*

II. ANATOMICAL BLOCK OF THE RETICULO-ENDOTHELIAL SYSTEM

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ALTHOUGH there is considerable evidence to show that hæmoglobin is broken down by the reticulo-endothelial cells and transformed into bilirubin, or at least into a precursor of bilirubin, final proof is still wanting. It appeared that if a complete block of the reticulo-endothelial system should be possible it would lead to the solution of the problem as to the site of bilirubin-formation.

Before discussing the possibilities of blocking the reticulo-endothelial system, it is necessary to discuss shortly the process of so-called intravital staining or storage. If a colloidal material is injected intravenously the substance disappears very quickly from the circulation (within a few hours). It does not seem likely that all has accumulated in the reticulo-endothelial cells. Our observations[1] with the microscope on the omentum of a living animal showed that a considerable amount of the substance (lithium carmine) passes through the capillary wall and stains diffusely the connective tissue. Anitschow[2] and Okuneff[3] have made similar observations on the walls of the larger vessels. We can therefore assume that only a part of the colloidal material is stored in the reticulo-endothelial cells, while another part is diffusely accumulated in the vessel-walls and in the connective tissue. Anitschow calls this part of the process "the primary stage of migration of the colloidal substance." During this stage only a very small quantity is excreted by the kidney. The diffuse imbibition of the connective tissue does not last very long. Part of the colloid is precipitated in the histiocytes of the connective tissue, while another part is reabsorbed into the circulation and eliminated by the kidney. The mode of entrance into the reticulo-endothelial cells cannot so far be definitely explained. Some investigators like Schuleman[4] make no distinction between phagocytosis and vital storage. Others such as v. Moellendorf,[5] consider phagocytosis a biological process intimately connected with the vital activity of the cell, and storage of particles a purely physical process. But since modern views explain phagocytosis by physico-chemical processes, especially changes in the surface tension, vital storage does not necessarily require a different explanation.

We have attempted repeatedly to produce a complete block of the reticulo-endothelial system with various colloidal materials, but with little success. The difficulty which usually arose was the toxicity of a blocking dose of the colloid. If fractional doses were given at daily intervals, the reticulo-endothelial cells proliferated in the meantime; the more we injected, the more reticulo-endothelial cells became available. It was therefore necessary to find a colloidal substance which even in very large doses would not have toxic effect. A colloidal suspension of thorium dioxide was at last found to fulfil these requirements.

The investigation of the effects of thorium dioxide in colloidal suspension seemed to us of twofold importance: (1) its experimental use in causing a complete block of the reticulo-endothelial system; and (2) its clinical use in x-ray diagnosis. These results have been published elsewhere.[6]

The animals used in these experiments were chiefly rats. The thorium dioxide in a 25 per cent colloidal suspension was slowly injected into the jugular vein at body temperature. The liver and spleen were well outlined in the x-ray film after 0.5 c.c. of thorium dioxide had been given. Smaller doses only showed a "misty" appearance of those organs. With increase of the dosage, the x-ray shadow of the liver and spleen became denser, reaching its maximum after about 1.5 c.c. to 1.75 c.c. of the thorium dioxide suspension had been given. No further increase in density of the x-ray shadow could be obtained with larger doses, and x-ray pictures

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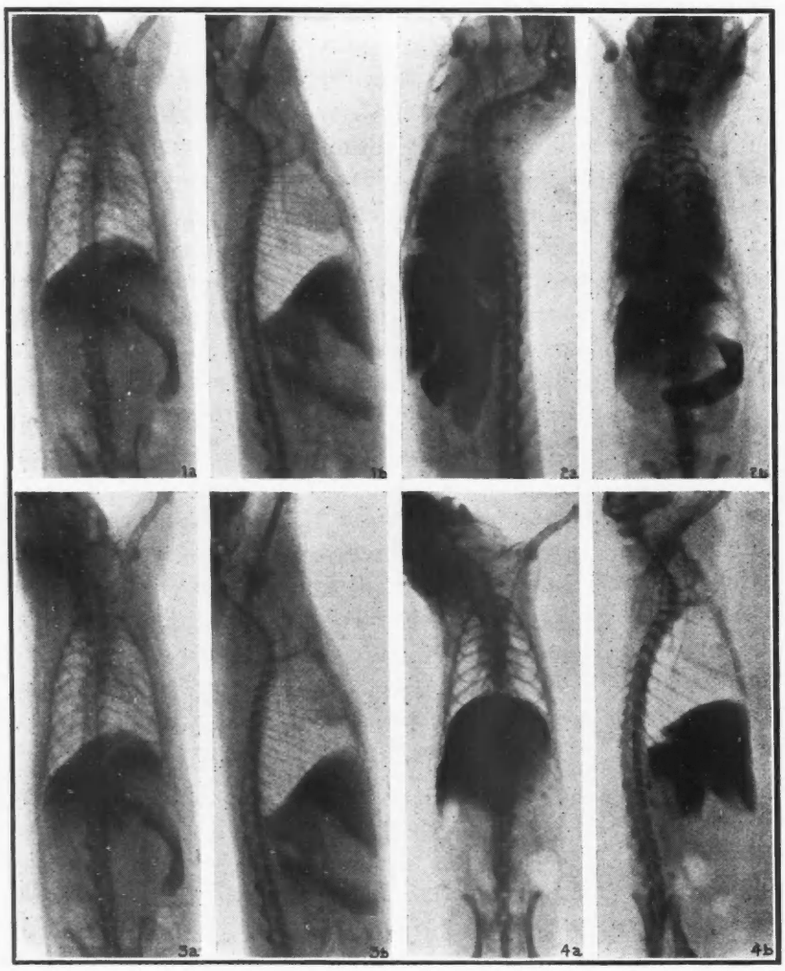
taken after 1.5 c.c. or 3.0 c.c. had been given did not show any difference in density. There was no further increase in density of the liver and spleen shadow after the injection of 3 c.c. of thorium dioxide as compared with the case where 2 c.c. had been injected.

It is necessary at this point to discuss shortly the mechanism by which the liver and spleen is outlined in x-ray. As before stated, colloidal substances are picked up from the circulation and stored by the reticulo-endothelial system. The thorium dioxide in the colloidal suspension is not penetrable by x-rays and throws, therefore, a shadow on the x-ray film. With a dose of 1.75 c.c. or more of the thorium dioxide suspension all available reticulo-endothelial cells of the liver and spleen are filled and no further increase in density could be reached; in other words, the reticulo-endothelial cells of the liver and spleen are a direct measure *in vivo* for the amount of blocking. Sections of liver and spleen confirmed this conclusion, as will be discussed later.

Several rats were injected one month after splenectomy. Here the x-ray shadow of the liver was much denser than in normal animals, if an equal dose of thorium dioxide was used. A possible explanation of this is a proliferation of the Kupffer cells of the liver after splenectomy. The greater number of Kupffer cells in the liver, therefore, is capable of storing a larger amount of thorium dioxide, thus throwing a much denser shadow on the x-ray film. Figs. 3a and 3b show the x-ray of a rat which had received 1 c.c. of thorium dioxide suspension. Figs. 4a and 4b show the x-ray of a rat which had a splenectomy about one month prior to the injection of 1 c.c. of the same. The difference in the density of the liver-shadow is striking.



FIGS. 1a AND 1b.—Radiograms of rat after injection of 1 c.c. of thorotrast.
FIGS. 2a AND 2b.—Radiograms of same rat after injection of 3 c.c. of thorotrast.
FIGS. 3a AND 3b.—Radiograms of rat after injection of 1 c.c. of thorotrast.
FIGS. 4a AND 4b.—Radiograms of rat; 1 c.c. of thorotrast was injected one month after splenectomy. Note the greater density of the liver shadow as compared with Fig. 3 (animal of equal weight).

Sections of almost all organs were studied. Pieces of the different organs were removed immediately after death, hardened in 10 per cent formalin (with exception of the bone-marrow which was fixed in Zenker's fluid), passed through alcohol and toluol, and then paraffin sections were cut. Sections, without counterstain, were studied under the dark field illumination, and others, after light counterstaining with hæmatoxylin, under ordinary illumination. The rats which had received a small dose of thorium dioxide, that is, 1 c.c. or less of the suspension, showed the Kupffer cells of the liver and the reticulum cells of the spleen to be well filled with thorium; occasionally some of the reticulo-endothelial cells of the bone-marrow also showed thorium granules in their protoplasm. Some of the Kupffer cells and reticulo-entholelial cells of the spleen were stuffed full, while others only showed a few fine granules. Those which had stored

the thorium to full capacity looked swollen, but if we compare them with other normal cells, *e.g.*, Kupffer cells, which are full of iron, we can see that we are dealing with a cell in full function and not with a pathological change. If sections are taken several weeks afterwards the picture is little changed, but many Kupffer cells, as well as many reticulo-endothelial cells of the spleen, show no thorium granules; they are apparently newly-formed cells.

Those animals which received larger doses of thorium dioxide showed an intensification of the picture described above, all the Kupffer cells and reticulo-endothelial cells of the spleen being stored to full capacity. In addition, the reticulo-endothelial cells of the bone-marrow also showed a good deal of storage. If 2.5 to 3 c.c. were used the reticulo-endothelial cells of the other organs were found to have stored thorium also. Sections taken some time later (about 10 days) showed evidence of a new reticulo-endothelial cell-formation.

The liver sections of splenectomized animals which had received thorium dioxide showed a much greater number of Kupffer cells per high power field. The increase in number of the Kupffer cells is the result of the splenectomy, a fact which has also been observed by McNee, Lephene, and others. The proliferation of the Kupffer cells explains the increase in the density of the liver shadow in the x-ray film as compared with normal animals.

In general, all the sections of the liver and spleen which had been taken about ten days after the last thorium dioxide dose show a marked increase in reticulo-endothelial cells. This proliferation we believe to be the result of a stimulation to new cell-formation by the colloidal storage—the response to an increased demand.

Animals which had received varying amounts of thorium dioxide intravenously were then injected with lithium carmine intraperitoneally. They were then killed and sections studied. The sections of the animals which had received both thorium dioxide and lithium carmine showed, if small doses were given, storage of thorium as well as of carmine; both substances could be seen in one and the same cell. When large doses of thorium dioxide were used, no carmine was stored if the carmine was injected 24 hours after the thorium. In those instances, however, where the carmine was injected eight to ten days after the thorium, carmine storage was observed again, but never in the same cells with the thorium. Apparently, new reticulo-endothelial cells formed after the blocking and only these cells were capable of new storage.

CONCLUSIONS

From the above it can be seen that if large doses of thorium dioxide (thorotrast-Heyden) are injected, a temporary block of the reticulo-endothelial system can be produced; that is, for at least eight to twelve days no further storage can be carried out by the reticulo-endothelial cells. It must, however, be admitted that the evidence for this blockage is anatomical.

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AMŒBIASIS: INCIDENCE IN PRIVATE PRACTICE.—H. S. Sumerlin presents a survey that shows the incidence of intestinal protozoa in individuals of a higher social status than that of indigent persons. It is a summary of the results of routine examinations of the stools of 1,852 patients during the past four years. The results of the examinations in the cases of 1,339 adults and 513 children are listed separately, to show the low incidence of protozoa as compared to adults. *Endamœba histolytica* was found in 31 adults, or 2.3 per cent, and in 2 children, or 0.4 per cent. Combining these results gives an incidence of 1.7 per cent. In three of the author's adult cases the infestation undoubtedly occurred outside the United States. In this series only one case of frank amœbic dysentery was encountered and that was in a 5 year old child. In only four cases were cysts absent from the stools. A comparison of the results of this survey with others made elsewhere indicates that the incidence of *Endamœba histolytica* varies from 0.2 to 15.58 per cent in the different studies. There is no doubt that the incidence varies with the class of patients and the geographic location. One cannot but wonder why, in view of the large number of people harbouring this parasite, so few cases of frank amœbic dysentery are seen and why there are not more local epidemics like the recent outbreak in Chicago. It has been stated repeatedly that a single fæcal examination will reveal only about half the protozoa that can be detected by multiple examinations. This has not been the author's experience. In 33 cases of infestation with *Endamœba histolytica*, the parasite was found in the first specimen in 31 cases, in the second in 1 case and not until the third examination in 1 case. The fact that the first specimen was collected following a saline cathartic probably explains these results. He found, however, that in some cases subsequent examinations revealed other species of protozoa not found on the first examination.—*J. Am. M. Ass.*, 1934, **102:** 363.

TUMOURS OF THE HEART: HISTOPATHOLOGICAL AND CLINICAL STUDY*

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TUMOURS of the heart are a pathological rarity. Some produce characteristic clinical manifestations, but are rarely recognized by the clinician. The clinical picture of cardiac tumour so often simulates that of more common cardiac lesions that the physician rarely suspects that such a condition may be present. Secondary tumour of the heart has been diagnosed clinically, and on rare occasions primary tumour has been suspected. Since early in the eighteenth century a vast literature concerning this relatively uncommon condition has accumulated. The publications of Farber and of Yater are accompanied by comprehensive bibliographies of this subject.

From 1915 to 1931, inclusive, 52 cases of secondary and 4 cases of primary tumour of the heart were discovered at necropsy in 8,550 subjects at the Mayo Clinic. The distribution of these tumours was as follows: of secondary tumours, 36 were carcinomas, 16 were sarcomas, and 6 malignant melanomas; of primary tumours, 2 were myxomas, 1 a rhabdomyoma and 1 an angioma.

PRIMARY TUMOURS

CASE 1

Myxoma of the left auricle.—This case has been adequately reported by Barnes and Yater[1] and by Yater,[4] and consequently need not be reported here. The patient was a woman aged 23.

CASE 2

Myxoma of the left auricle.—A woman, aged 34, came to the clinic April 22, 1928, complaining of having had pains in the right lower part of the abdomen for three weeks, and chills and fever for one day. The patient had missed a menstrual period which had been due about the first of April. Then she had begun to experience sharp pains in the lower part of the abdomen. These had lasted for about a week, when she had inserted a rubber catheter up the vagina, hoping to obtain relief. There had been a slight bloody discharge, but the pain continued. April 21, she had passed a blood clot and an hour or so later she had had a chill which had lasted for five or ten minutes. The day of admission she had three severe chills and her temperature rose to 103° F. The patient had five living children, and had had four miscarriages and two still-births. Since 1917 she had been at the clinic several times on account of pregnancy, and for the following operations: excision of a small cyst-like mass on the outer aspect of the proximal phalanx of the fourth finger, which was diagnosed a giant-cell tumour; excision of a small fibroma molluscum from the skin of the right scapular region; trachelorrhaphy and excision of a small cyst of the cervix, perineorrhaphy and appendectomy. Since 1925 she had noticed increasing dyspnœa on exertion. There was nothing in her history suggestive of heart trouble.

The patient was fairly well developed and well nourished. The skin was moist and the face flushed. The heart and lungs were negative. The blood pressure in millimetres of mercury was 102 systolic and 88 diastolic. The pulse rate was 100. The uterus was enlarged to about twice its normal size, and marked tenderness was elicited to the right of the fundus. On April 23, 1928, the patient passed several blood clots, among which was found a hairpin. Following this she became very weak with rapid, thready pulse; cyanosis of the lips and laboured respirations were observed. She failed to respond to intravenous treatment and death ensued a few hours later.

The clinical diagnosis was septicæmia and attempt at self-induced abortion.

At necropsy a moderate amount of blood-tinged fluid in the peritoneal cavity, passive congestion of the lungs, and slight congestion of the liver were noted. There was evidence of chronic interstitial pancreatitis with a moderate amount of fat replacement of the pancreas. The uterus revealed endometritis, and there were a few small leiomyomas in its wall. Culture of the peritoneal fluid demonstrated the presence of hœmolytic streptococci, but culture of the heart's blood gave negative results.

The heart weighed 367 g. There was an egg-shaped, yellowish-white, elastic tumour in the left auricle, measuring 6 cm. in length, 3.7 cm. in width, and 4.4 cm. in its anteroposterior diameter (Fig. 1A). It was attached by a broad base to the interauricular septum, directly over the site of the fossa ovalis; it practically filled the left auricle, and extended for a short distance through the mitral orifice. There were a few small, bright red, hæmorrhagic areas beneath its surface. To the right of the point of its attachment to the auricular wall was an area of thrombus formation, and adhesions had formed between the tumour and the wall of the auricle. The cut surface of the tumour was yellowish white, and there were a few small, hæmorrhagic areas near its upper pole. There were a few small subepicardial hæmorrhages on the left auricle and on the right ventricle. The ventricles were dilated, especially the left, and the wall of the latter chamber was thinned. The heart muscle appeared to be in good condition. An ante-mortem thrombus, measuring 2 by 0.9 by 0.7 cm. in diameter, was caught on the edge of a small, fenestrated Eustachian valve. The tricuspid orifice was considerably dilated. The foramen ovale was closed. Only a slight amount of coronary sclerosis was present.

Histological examination of sections of the tumour, stained by hæmatoxylin and eosin, revealed a palely eosinophilic staining, fibrinous matrix, among which was a fine, granular substance (Fig. 1B). There were numer-

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ous oval or elongated cells of endothelial type, the majority of which were in cord-like formation, and others in groups. These cells were in general placed with their long axes in the same direction. The cytoplasm assumed a pale eosinophilic stain. The nuclei were basophilic, oval or elongated, and slightly granular. They were fairly large, and there were several nuclei in a single cell. A few delicate blood vessels were scattered throughout the sections. They seemed to be in the same stage of development, and were congested with blood. One vessel contained an organizing thrombus. There were a few lymphocytes and polymorphonuclear leukocytes scattered throughout the sections. A few cells, which appeared to be plasma cells, and an occasional eosinophilic leukocyte could also be seen. Sections revealed a considerable quantity of mucin, which was evenly distributed. The van Gieson stain demonstrated the presence of a moderate amount of fine fibrous connective tissue throughout the sections and beginning hyaline degeneration of the capsule. Elastic tissue was also present, as demonstrated by the Weigert stain.

The pathological diagnosis of the tumour was fibromyxoma.

CASE 3

Lymphangioma of the right auricle.—A boy, aged ten months, was brought to the clinic on August 10, 1925, because of a tumour of the left side of the neck, which had been present since birth. It extended from the submental region to the post-auricular region, and from the level of the eye down on to the neck. The mass had fluctuated in size, and the child occasionally had slight fever. There had always been noticeable wheezing with respiration, but no particular discomfort was shown until May, 1925, when the tumour began rapidly to increase in size. The area over the swelling became reddened and the temperature rose to 102° F. The child began to experience difficulty in swallowing liquids, and the respirations became more laboured. A considerable amount of weight had been lost since June, 1925, and he had become pale.

The child appeared anæmic, poorly nourished, and held his head to the right. A large, movable, cystic tumour on the left side of the neck extended from the left submental region backward over the jaw and neck, and into the posterior cervical region. There was slight bulging of the pharyngeal wall on the left side. The heart and lungs were negative, but other abnormal findings were not noted. A roentgenogram of the thorax revealed a slight increase in the width of the mediastinal shadow, which was considered to be due to enlargement of the lymph nodes. Erythrocytes numbered 3,270,000 and leukocytes 15,000 in each cubic millimetre of blood, and the concentration of hæmoglobin (Dare) was 48 per cent.

A course of radium therapy failed to prove of benefit. The temperature rose to 104° F., and the dysphagia and dyspnœa became more pronounced. Feedings were given by tube and rectum, but the child became progressively weaker and died on September 6, 1925, twenty-seven days after admission.

The clinical diagnosis was cystic hygroma of the neck.

At necropsy partial atelectasis of both lungs was noted. There was a large, cystic, encapsulated mass

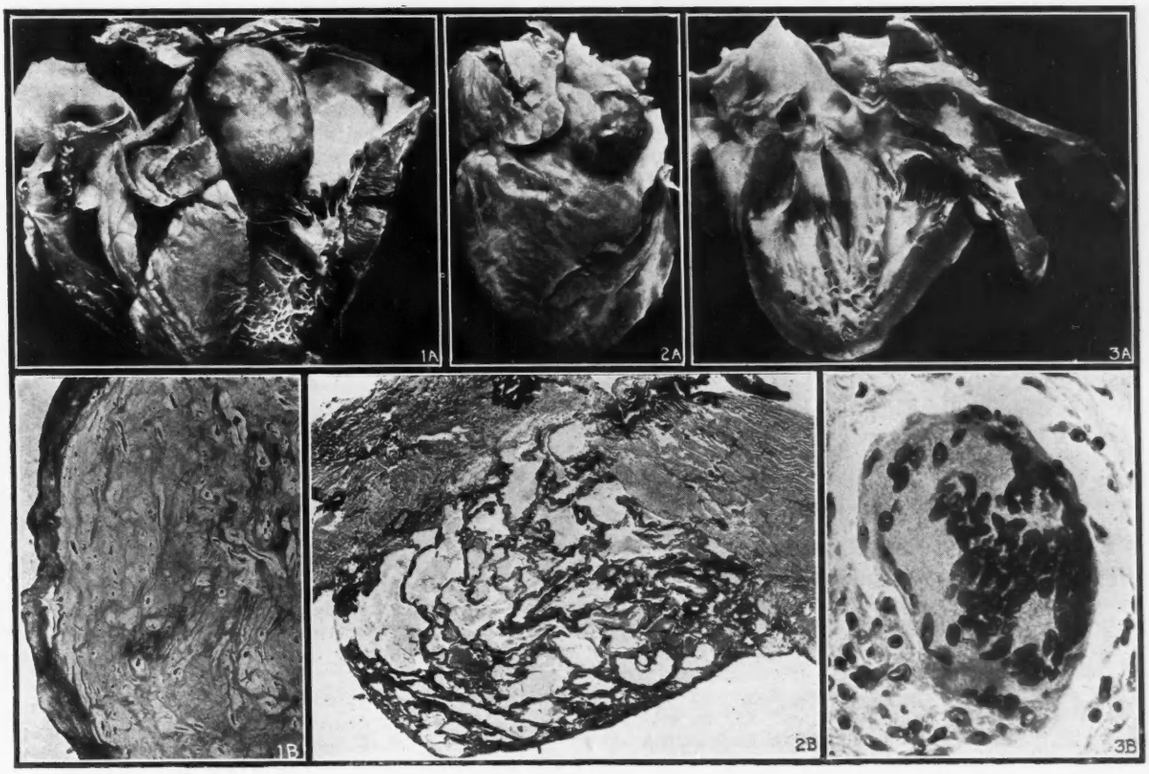

FIG. 1A. (Case 2).—Fibromyxoma of the left auricle.

FIG. 1B. (Case 2).—Photomicrograph of myxoma, demonstrating the fine fibrous connective-tissue stroma, and the beginning hyaline degeneration of the capsule (x75).

FIG. 2A. (Case 3).—Lymphangioma of the right auricle.

FIG. 2B. (Case 3).—Photomicrograph of lymphangioma through the pedicle. The connective-tissue of the tumour is continuous with that of the surface of the auricle (x7¾).

FIG. 3A. (Case 4).—Rhabdomyoma of the heart; the tumour nodules in the left ventricle and myocardium may be noted.

FIG. 3B. (Case 4).—Photomicrograph of rhabdomyoma cell, demonstrating the granular character of the cytoplasm. The cross striations are not clearly seen (x660).

on the left side of the neck which contained many multilocular cysts. Some were clear vesicles, and others were reddish. The mass extended from the parotid gland above to the clavicle below, and to the trapezius muscle posteriorly. It also extended mesially to surround the trachea and larynx. The left jugular vein and its branches were incorporated in the mass, which was densely adherent to adjacent structures. The tumour encroached on the left side of the larynx and involved the false vocal cords, thereby causing partial obliteration of the lumen of the air passages. Numerous encysted regions containing purulent-appearing material were encountered. Situated laterally to and below the left tonsil, and laterally to and slightly above the epiglottis, was a fairly large retropharyngeal abscess in the substance of the growth. On section this mass was seen to be composed of a large number of cysts which varied considerably in size. Some contained a clear, light, yellow fluid, and in others the content appeared hæmorrhagic. One large cyst contained a reddish, degenerating mass which appeared to be old blood. The general appearance of the stroma was that of fibrous tissues.

The heart weighed 60 g. Just to the left of the right auricular appendage was a soft, cystic, bluish red mass, measuring 2.5 by 1.5 by 1 cm. in various diameters (Fig. 2A). It was attached to the surface of the auricle by a broad base. Section revealed several cysts. The majority contained a clear fluid, but a few were filled with a reddish material, which appeared to be blood. The appearance of the stroma was that of fibrous tissue. Except for the tumour, the heart appeared normal.

Histological examination of sections of the tumour, stained by hæmatoxylin and eosin, revealed many cystic areas. The majority of the cysts contained a clear, homogeneous substance, and a few contained erythrocytes with an occasional lymphocyte and polymorphonuclear leukocyte. The walls of the spaces were lined by flattened endothelial cells, and there was no evidence of muscle tissue. Between the spaces there was a fine, fibrous, connective-tissue stroma, among which could be seen scattered lymphocytes, polymorphonuclear leukocytes, and an occasional plasma cell. Lymph nodes, a few delicate blood vessels, and an occasional nerve bundle were scattered throughout the stroma. The connective-tissue of the tumour was continuous with that of the surface of the auricle (Fig. 2B).

The pathological diagnosis of the tumour was lymphangioma.

The tumour of the heart was not connected with that of the neck and mediastinum. It was considered to be a separate lymphangioma which was probably formed from the lymphatic channels of the auricular surface of the heart.

CASE 4

Rhabdomyoma of the heart.—A woman, aged 45, came to the clinic on December 6, 1929, complaining of repeated "convulsions" over a period of two months. She had felt well until about October 7, 1929, when she suddenly lost consciousness while bending over at work. This was followed by two similar attacks on the same day and one on the following day. The physician who examined her on the day of her first convulsions informed her that the heart rate was 28 beats to the minute. She was then free from attacks until about October 21, 1929, after which she began to have daily "convulsions", sometimes as many as fifteen or twenty in an hour. She stated that the attacks were increasing in severity. Without any apparent warning, she would suddenly lose consciousness, breathe very heavily, and have spasmodic movements of the face and upper extremities. The attacks lasted for an interval of thirty to sixty seconds, and would leave her very weak, extremely exhausted, and with a desire to sleep. She stated that her pulse had been slow since the onset of the trouble. Her past history was of no particular significance.

The patient was well developed, well nourished, and somewhat drowsy. The pulse rate was 32 beats a minute. The blood pressure was 105 systolic and 50 diastolic. Examination of the heart was negative, except for an apex rate of 32 beats each minute. Neurological examination gave negative results. A roentgenogram of the thorax revealed slight enlargement of the heart to the left. The electrocardiogram gave evidence of complete auriculoventricular dissociation, with a ventricular rate of 24 and an auricular rate of 67 beats a minute. There was evidence of left ventricular preponderance, with a notched P wave in leads I and II, and an inverted T wave in lead I. The Wassermann reaction of the blood was negative.

The pulse rate fell to 28 beats a minute. The patient continued to experience frequent convulsive attacks lasting five to sixty seconds. She gradually became weaker and death ensued sixteen days after admission.

The clinical diagnosis was complete heart block with Stokes-Adams' disease.

At necropsy healed pyelonephritis and several diffuse cysts of the mucous membrane of the bladder were observed. The cysts measured about 0.5 cm. in diameter, and were situated at the uretero-vesical juncture. The pericardial sac contained about 100 c.c. of clear, straw-coloured fluid.

The heart weighed 362 g. The muscle was reddish brown and firm. There were multiple, small, whitish nodules on the epicardial surface of the left ventricle. They were irregularly quadrilateral and subepicardial. There was a firm, whitish nodule in the right ventricle, situated just below the cusps of the pulmonary valve. It measured 2 by 1 cm., and projected into the myocardium of the right ventricle for a distance of approximately 0.6 cm. There was a similar nodule in the left ventricle, situated just below the aortic cusps. It measured 3 by 2 cm., and invaded the interventricular septum. There were two nodules in the myocardium of the left ventricle (Fig. 3A). One measured 2 by 1 cm., and involved the interventricular septum. The other measured 1 by 1 cm., and invaded approximately the entire thickness of the ventricular wall near the apex. The cut surface of the tumour was yellowish white and homogeneous. The tumour tissue was sharply demarcated from the surrounding cardiac tissue, but was not encapsulated.

The endocardium, valves, and chambers of the heart did not present any other lesion worthy of note.

Microscopic examination of the sections taken from the nodules, stained with hæmatoxylin and eosin, gave evidence of replacement of the normal heart tissue by a young type of connective-tissue trabeculæ. Many irregular, clear areas were scattered among the stroma. They varied from round to oval, and gave a sponge-like appearance to the tumour tissue. These areas could best be seen by means of the van Gieson, and Mallory-Heidenhain stains. Delicate blood vessels were observed among the connective-tissue network.

Numerous, large multinucleated cells were scattered irregularly throughout the tumour. They appeared to be giant cells of a granulomatous reaction, but acid-fast bacilli could not be found in sections stained by the Ziehl-Neelsen method. The nuclei of these cells were for the most part situated at the periphery, or grouped in clusters at one pole of the cell. They were oval or fusiform, and each contained a deeply-stained nucleolus. The cytoplasm was granular, and assumed a palely eosinophilic stain with hæmatoxylin and eosin (Fig. 3B). The granular nature of the cytoplasm was demonstrated more clearly by Mallory's phosphotungstic acid-hæmatoxylin stain. Many of these granules were arranged in parallel rows, which gave the appearance of cross striations.

There were clear areas between the giant cells and the connective-tissue. Numerous cells, which appeared to be lymphocytes, were scattered among the stroma. Mitotic figures were not seen.

The first observation of these sections gave the impression that the tumour was granulomatous. Suitable methods of staining, however, demonstrated more clearly the granular cystoplasm of the giant cells, and evidence of cross-striations could be seen in some of the cells studied under high magnification. This observation, together with the general appearance of the tumour tissue, and the inability to demonstrate acid-fast bacilli after repeated attempts with sections from various areas, led to the conclusion that the tumour was probably a rhabdomyoma.

SECONDARY TUMOURS

Thirty-six cases of secondary carcinoma and 16 cases of secondary sarcoma of the heart were found at necropsy at the Mayo Clinic during 1915-1931, inclusive. This gave an incidence of approximately 0.4 per cent for metastatic carcinoma, and approximately 0.2 per cent for metastatic sarcoma among the 8.550 post-mortem examinations made.

TABLE I.

PRIMARY SITE OF MALIGNANCY IN CASES OF SECONDARY TUMOUR OF THE HEART (52 CASES)

Primary Site of Malignancy	*Carcinoma*	*Sarcoma*
Breast	6	
Bladder (urinary)	4	
Stomach	4	
Skin	4*	
Kidney	3	
Pancreas	3	2
Eye	2*	
Lung	2	1
Suprarenal glands	1	
Bronchus	1	
Œsophagus	1	
Gall bladder	1	
Liver	1	
Thyroid Gland	1	
Uterus	1	
Lymph Nodes		7
Bone (femur)		1
Ovary		1
Spleen		1
Toe		1
Thymus		1
Unknown	1*	1
Total	36	16

*Malignant melanoma.

In these cases of secondary tumour of the heart, metastasis had occurred from the various organs of the body in which neoplastic change is commonly found. The relative incidence of the primary sites of malignancy from which metastasis occurred in the heart may be noted in Table I. The majority of the secondary growths in the heart were considered to have metastasized by way of the blood stream. In many cases microscopic examination revealed tumour cells within the lumen of the coronary arteries. In other cases, malignant cells simulating those of the primary neoplasm were observed in the thrombotic masses within the chambers of the heart. In a few cases tumour cells were seen by microscopic examination within the lymphatic channels of the heart. In one case of primary carcinoma of the bronchus the superficial lymph nodes of the heart were dilated with actively growing malignant cells. This condition has been observed by previous authors and termed carcinomatous lymphangitis. The probable modes of metastasis may be noted in Table II.

TABLE II.

MODE OF METASTASIS

	Carcinoma		*Sarcoma*	
	Cases	*Per cent*	*Cases*	*Per cent*
Blood stream	26	72	6	37
Lymphatic structures and blood stream	5	13	2	12
Direct invasion	3	8	8	50
Lymphatic structures	2	5		
Total cases	36		16	

Primary or secondary intrathoracic growths were associated in 32 cases (88 per cent) of metastatic carcinoma of the heart. In 26 of these (72 per cent) the lungs were involved. Fourteen cases (87 per cent) of secondary sarcoma of the heart were associated with malignant growth in other intrathoracic structures, and in 6 of these (42 per cent) the lungs were involved. Metastasis associated with secondary tumours of the heart may be noted in Table III.

Signs of congestive heart failure were commonly found in association with the cardiac malignancy. The most common of these were ascites and pleural effusion. The incidence was as follows. Ascites occurred in 9 cases of carcinoma and in 9 cases of sarcoma; hydrothorax occurred in 9 cases of carcinoma and in 6 cases of sarcoma; hæmothorax occurred in 5 cases of carcinoma and in 1 case of sarcoma; hydropericardium occurred in 5 cases of carcinoma and in 2 cases of sarcoma; and hæmopericardium occurred in 4 cases of carcinoma and in 4 cases of sarcoma.

These secondary cardiac tumours varied in size, shape, and appearance. In some cases small, whitish, firm nodules were scattered dif-

fusely through the myocardium; in other cases there was a single isolated nodule in the myocardium; and in others practically the entire heart was involved in metastatic growth. Thrombotic masses which contained tumour cells, and malignant polyps were also observed. The histological structure of the secondary cardiac tumour simulated the primary lesion and the metastatic growths in other parts of the body.

The incidence of the types was as follows. In 15 of 36 cases (41.6 per cent) the carcinoma was single; in 13 (36.1 per cent) it was multiple; and in 8 (22.2 per cent) it was diffuse. In 5 (31.2 per cent) of 16 cases the sarcoma was single; in 10 (62.5 per cent) it was multiple; and in 1 (6.2 per cent) it was diffuse.

TABLE III.

METASTASIS ASSOCIATED WITH SECONDARY TUMOURS OF THE HEART

Organ Involved	*Instances*	
	Carcinoma	*Sarcoma*
Suprarenal glands	16	2
Bile ducts	1	
Bladder	2	1
Bone	13	5
Brain	6	1
Breast	2	
Bronchus	1	
Diaphragm	8	3
Duodenum	3	1
Epididymis	1	
Œsophagus	1	
Gall bladder	3	2
Intestines	12	1
Kidneys	16	5
Liver	24	3
Lungs	26	6
Lymph nodes	29	9
Mesentery	5	
Muscle	2	1
Omentum	7	1
Ovaries	5	1
Pancreas	12	3
Pericardium	16	5
Peritoneum	7	
Pleura	10	3
Prostate gland	1	
Rectum	1	
Spleen	6	1
Stomach	8	3
Thymus	2	2
Thyroid gland	1	2
Trachea	1	1
Ureter	3	
Uterus	1	
Vagina		2

The distribution of the secondary tumours in the heart was extremely variable, but the right side of the heart was affected slightly more commonly than the left (Table IV).

TABLE IV.

DISTRIBUTION OF SECONDARY TUMOURS IN HEART

Tumour	*Left ventricle*	*Right ventricle*	*Left auricle*	*Right auricle*	*Both auricles*	*Interventricular septum*	*Interauricular septum*	*Diffuse*
Carcinoma	13	9	4	9	2	1		8
Sarcoma	5	8	1	4	1		1	1
Total	18	17	5	13	3	1	1	9

The clinical picture of the secondary cardiac tumours varied greatly, and in only one case was a diagnosis made clinically. This case has been reported by Willius and Amberg,[3] and was an example of sarcoma of the left femur, affecting a girl, aged eight years, who had no former history or clinical evidence of heart disease; evidence of incomplete bundle-branch block developed. The age and incidence by sex, and the duration of symptoms are given in Table V.

TABLE V.

AGE AND INCIDENCE BY SEX OF HEART DISEASE

Tumour	*Age incidence*		*Sex incidence*		*Duration of symptoms*	
	Years	*Average*	*M.*	*F.*	*Months*	*Average*
Carcinoma	32 to 71	53	26	10	¾ to 120	22½
Sarcoma	2½ to 63	29	11	5	1 to 29	13

In the majority of the cases cardiac symptoms were not noted; in others the symptoms were indefinite, and could not be directly attributed to heart disease. The chief signs and symptoms were dyspnœa, cyanosis, tachycardia, cardiac enlargement, congestive signs, auricular fibrillation, extra-systoles and bundle-branch block. In only 5 cases were there any definite cardiac symptoms which may have been suggestive of secondary involvement of the heart.

CONCLUSIONS

1. Primary tumour of the heart occurs in about 0.05 per cent of cases which come to necropsy.

2. The majority of primary cardiac tumours are benign, and about 25 per cent are malignant.

3. The most common primary cardiac tumour is myxoma. Sarcoma and rhabdomyoma range next in frequency. Other primary neoplasms found in the heart are fibroma, lipoma, angioma, and carcinoma. Carcinoma of the heart is probably always secondary.

4. Secondary malignant lesions of the heart are discovered at necropsy in about 0.6 per cent of cases.

5. Metastasis to the heart comes from various organs of the body in which malignant change is commonly found. The incidence of cardiac metastasis is relatively much higher when mediastinal structures are involved.

6. The right side of the heart is more commonly involved by secondary neoplastic growth than the left side. This may be explained on a blood-vascular basis.

7. There are no definite pathognomonic signs or symptoms of heart tumour. Sudden and unexpected onset of cardiac symptoms, which are progressive and regressive, and especially if associated with an evanescent cardiac murmur and with cardiac failure which is not responsive to digitalis, strongly suggests a tumour of the heart. Metastatic tumours of the heart have been diagnosed clinically, and on rare occasions primary cardiac neoplasms have been suspected.

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TUBERCULOSIS OF THE THYROID GLAND WITH REPORT OF A CASE IN A CHILD AGED THREE*

BY L. M. LINDSAY, M.D., *Physician, Children's Memorial Hospital* AND C. I. MEAD, M.D., *Resident Pathologist, Children's Memorial Hospital, Montreal*

THE early writers on diseases of the thyroid gland stated that this gland always escapes tuberculous infection. Rokitansky,[24] in 1861, said the gland had some special immunity and was never involved in tuberculosis. Virchow[8] in his early writings stated that there was some antagonistic action between the thyroid gland and the tubercle bacillus. He later discovered 3 cases of tuberculosis of the thyroid gland at post-mortem. These positive statements by such prominent men undoubtedly retarded the progress of study in this subject. During the present century, however, greater strides were made in the study of the condition, both from the experimental and clinical standpoints. During this period, thyroidectomies became more numerous and the histological study of these resected glands increased our knowledge of the subject. The increase in the number of recorded cases during the last decade is probably relative rather than actual.

The first case of tuberculosis of the thyroid gland on record was found at autopsy and reported by Albers[9] in 1847. Bruns,[1] in 1893, was probably the first to report a case diagnosed at operation. Since the report by Albers about 255 cases have been recorded in the literature. From this one can see that the incidence of tuberculosis of the thyroid is very low compared with that of tuberculous lesions in other parts of the body. Of these 255 cases, 125 were discovered during operation or on histological study of the gland following operation. The remaining 130 were found at autopsy, and consist chiefly of cases in which there were miliary tubercles of the thyroid associated with an acute generalized miliary tuberculosis. Rankin and Graham,[7] in 1932, made a careful study of the 125 cases in which tuberculosis of the thyroid was diagnosed at the time of operation or by histological examination of the gland. Of these, 104 were selected from the literature and 21 added from the records of the Mayo Clinic. Rankin's and Graham's 21 cases occurred in 20,758 thyroidectomies at the Mayo Clinic, an incidence of 0.1 per cent. The diagnosis was made either from a clinical

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or microscopical study. In these 125 cases there were 102 women in whom the age incidence was 37.5 years, and 19 men, with an age incidence of 30 years. Coller and Huggins,[3] in 1926, reviewed the clinical and pathological records of 1,200 thyroidectomies and found the incidence of tuberculosis to be 0.4 of one per cent. In a series of approximately 10,000 thyroidectomies at the Crile Clinic, the incidence was 0.15 per cent. There is quite close agreement between the figures from the three clinics; all show a very low incidence of tuberculosis. The age incidence of the miliary type of lesion was higher in the first decade, when acute miliary tuberculosis is more common.

The classification of these lesions has usually been based upon the pathological findings. The classification which has been suggested by Higgins[4] and Budd and Williams[2] is based on the pathological manifestations of the disease. The first group consists of cases which show miliary tubercles of the thyroid gland. Most of these are associated with an acute generalized miliary tuberculosis. The tubercles are usually small, grey in colour and microscopic in size. The second group is composed of those in which the thyroid gland shows caseous areas or actual tuberculous abscesses. This group is more commonly associated with pulmonary tuberculosis or tuberculous cervical adenitis. The early form of the caseous type shows an infiltration with lymphocytes, epithelioid cells, Langhans' giant cells and mononuclear cells. These lesions may vary in size from a few millimetres to involvement of the entire gland. This type of tuberculosis is usually associated with enlargement of the gland and is more commonly found in the adenomatous type of thyroid. A few of the authors have included a third group, which they call the fibrous or sclerosing type; Budd[2] and Higgins[4] are two of the more recent advocates of this last. This group comprises a very small number of cases. The thyroid glands here are small, fixed, and very hard, and made up chiefly of a dense fibrous connective tissue, with areas of calcification. This group represents a healed or arrested type of tuberculosis.

Rankin and Graham[7] classified their 125 cases of tuberculosis of the thyroid in which thyroidectomies had been done, under the following headings:—

Diffuse tuberculosis in the thyroid gland.....60
Miliary tuberculosis in the thyroid gland.....39
Caseous lesion in the thyroid gland.....18
Sclerosing lesion in the thyroid gland..... 2
Tuberculous abscesses in the thyroid gland.... 6

Many of the French writers describe a fibrous or sclerotic type of thyroid gland without typical tubercles in patients who have died of pulmonary tuberculosis. This is now generally thought to be due to a toxic change in the thyroid and not the result of an actual invasion of it by the tubercle bacillus.

One can conclude from the experimental work done on animals by different investigators that tuberculosis of the thyroid gland can be produced only by giving the animal an overwhelming infection. In smaller doses, only the lungs, spleen and kidneys become involved. Plummer and Broders[6] feel there is some relationship between hyperthyroidism and tuberculosis of the thyroid. They state: "Either a hypertrophic gland is rendered more susceptible to invasion by the tuberculosis bacillus or the infection stimulates the parenchyma to abnormal activity and is thus indirectly responsible for the hyperthyroidism with its attendant symptoms."

Moisman[5] also felt there was some relationship between hyperthyroidism and tuberculosis of the thyroid. He cites several cases to substantiate this belief. Coller and Huggins[3] are of the opposite view; they state: "From a study of the literature, it appears that an extensive tuberculosis of the thyroid gland produces no change in the function of the gland except in the direction of myxœdema", and that "The parenchyma of the experimental tuberculous thyroids in animals was not stimulated to a hyperactive state." They feel that the adenomatous type of gland is more susceptible to the invasion and development of tuberculosis than is the normal or the Graves' constitution thyroid. Rankin and Graham state that hyperthyroidism and tuberculosis of the thyroid are more than an incidental finding. Fifteen of their 21 cases and many others in the literature showed signs of hyperthyroidism. They are not prepared to state which comes first, the hyperplastic gland or the tuberculosis.

The symptoms and physical signs of tuberculosis of the thyroid are very variable. Rankin and Graham state that from their study of the 125 operation cases, no syndrome or group of

symptoms can be selected which would aid in diagnosis. Coller and Huggins from their analysis of the cases in the literature and cases in their own series have classified the symptoms and signs of tuberculosis of the thyroid under the following headings.

1. Symptoms and signs of hyperthyroidism from an associated adenomatous goitre; nervousness, tachycardia, palpitation, loss of weight and increased basal metabolic rate.
2. Pressure symptoms:
   a. Pressure on the trachea, (1) sudden; (2) gradual.
   b. Pressure on the skin with rupture and redness.
   c. Pressure on the œsophagus, (1) dysphasia or, (2) rupture.
   d. Pressure on the recurrent laryngeal nerve.
   e. Pressure on the sympathetic nerves with pupillary changes.
   f. Rupture into a vein.
   g. Rupture into the mediastinum.
3. Symptoms of infection:
   a. Swelling without heat or redness.
   b. Hyperæmia only when it reaches the skin.
   c. Persistent sinuses.
4. Hypothyroidism from destruction of the gland.

Most of the cases of tuberculosis of the thyroid gland which came to autopsy showed tuberculous lesions in other organs, chiefly in the lungs and the cervical lymph glands. In the group of 125 surgical cases reported by Rankin and Graham, only 6 showed clinical evidence of tuberculosis in other parts of the body. In spite of this, they are of the opinion that some other tuberculous lesion probably exists in the majority of cases. With this statement we agree.

From the wide variety of symptoms which are associated with this condition, one can readily see the difficulties in diagnosis. Very few cases have been diagnosed prior to operation or histological examination of the gland. Whenever there is gradual enlargement of the thyroid gland with associated tuberculosis in the cervical lymph glands, or in some other part of the body, one should keep this condition in mind either in the presence or absence of hyperthyroidism. The diagnosis in the remainder of the cases will probably not be made until histological examination of the gland. Diagnosis of the healing or sclerosing type is usually confused with malignancy of the thyroid gland since the glands in both are very hard and fixed. A history of tuberculosis and duration of the mass may aid in the differentiation.

The cases on record which have been subjected to partial thyroidectomies gave equally as good results as the uncomplicated adenomatous or exophthalmic goitre.

The case which we are reporting presents three of the more unusual manifestations of tuberculosis in children; a caseous type of tuberculosis of the thyroid, a tuberculoma of the epicardium, and a solitary tuberculoma of the brain.

CASE REPORT

The patient was a coloured boy aged three, Hospital number 2729-H, who entered the Children's Memorial Hospital on February 10, 1933, with complaints of some loss of weight, convulsions and cough.

Personal history.—The child is said to have developed normally for his first year. At the end of this time he began having convulsions, which were of short duration at first, with a frequency of two to three a day. The convulsions were apparently generalized, with shaking and rigidity of the entire body. These persisted with free intervals of a few days to two months until admission to the hospital. During the few weeks just prior to admission the convulsions were of longer duration, sometimes lasting one to two hours without a residual period of stupor. One week before admission to the hospital, he developed coryza, a cough and high fever. From this time until admission to the hospital he had a profuse nasal discharge, fever, cough, anorexia and some loss of weight. There was no history of his having had measles, pertussis, or other infections.

Family history.—The mother is alive and well. The father died of pneumonia. Two other children are alive and well. One brother, aged seven, died of tuberculosis, one year before onset of this child's acute symptoms. Two other children are in this hospital at the present time with glandular tuberculosis.

Physical examination.—Examination on admission February 10, 1933 (ten days after the onset of acute symptoms), showed a fairly well developed and nourished coloured boy, who appeared very sick and irritable. He cooperated poorly, holding himself rigid. His alæ nasi were working and he had rapid and laboured breathing. His temperature was 103°, pulse rate 120 per minute, teeth carious, his breath foul, and his tongue heavily coated. The pharynx was injected and the tonsils enlarged and reddened. The cervical lymph glands were enlarged on both sides.

A firm mass was noticed in the neck over the anatomical location of the left lobe of the thyroid gland. The mass measured about one and one-half inches in length and one inch in width, lying mostly to the left of the mid-line with its right border reaching to the right border of the trachea. The mass was more easily palpated when the child cried or sat up in bed, and appeared to decrease in size when the child was recumbent: it was slightly moveable, but not freely so. There was no involvement of the skin over this area.

The chest moved symmetrically on respiration, and there was resonance to percussion in all areas except the left lower chest, where the note was impaired. Over the area of impairment of resonance there were moist râles, but no bronchial breathing. The heart was normal in size and no murmurs or friction rub were heard. The abdomen was distended, making examination difficult. The pupils were normal and the fundi negative. There were no pathological reflexes.

Laboratory findings—Red blood cell count 2,660,000; white blood cell count 10,000; differential count showed 48 per cent neutrophilic polymorphonuclear leucocytes, 48 per cent lymphocytes, and 4 per cent mononuclears. The blood calcium was 9.0 mgm. per 100 c.c. and the blood phosphorus 7.68 mgm. per 100 c.c. The blood Wassermann was negative. The Mantoux test was positive in dilutions of 1/10,000 (0.01 mgm.). Tubercle bacilli were found in the sputum. The urine was negative.

FIG. 1

FIG. 2

FIG. 3

FIG. 1.—The tuberculous thyroid before removal at post-mortem.

FIG. 2.—Showing caseous tuberculosis of the thyroid, tuberculous pleurisy on the left, and a tuberculoma of the heart. The arrow points to the last mentioned lesion.

FIG. 3.—A solitary tuberculoma of the right frontal lobe of the brain.

X-rays of the chest were taken the day of admission and showed a broncho-pneumonic consolidation of the left chest with pleural thickening one-fourth of an inch in thickness along the periphery. The superior mediastinum was widened.

Clinical course.—The course of this child's illness was steadily downward. His fever remained about 103°, with a pulse rate of 120 per minute. The cough persisted, respirations remained rapid and laboured, and there were several generalized convulsions before death. The cystic mass in his neck over the anatomical location of the thyroid enlarged, reaching three inches in length and two inches in width. The greatest enlargement was to the left of the mid-line. X-ray examination was made of the cervical spine and no evidence of tuberculosis was found. The child died on March 13, 1933, six weeks after onset of his acute symptoms.

Clinical diagnosis.—(1) Pulmonary tuberculosis; (2) tuberculosis of the thyroid gland; (3) tuberculous cervical adenitis.

Abstract of autopsy report.—(A-33-27). The body was that of a coloured male child showing extreme emaciation. There was a mass in the neck as described in the clinical history. The peritoneal cavity contained about 300 c.c. of a straw-coloured fluid. The intestines were matted together by tuberculous tissue. There were tuberculous areas in the parietal peritoneum over the right lobe of the liver. The mesenteric glands were enlarged, measuring 1 cm. in diameter and were caseous. There were sub-peritoneal tuberculous foci in the wall of the small and large bowel, varying from 1 mm. in places to 5 mm. in diameter. The left pleural cavity was completely obliterated by dense tuberculous tissue, in places 5 mm. in thickness, with areas of caseous material here and there. The lungs showed diffuse tuberculous broncho-pneumonia.

"The pericardial cavity contains only the usual amount of fluid. There are no tubercles on the pericardial surface and no pericardial adhesions. The epicardium is smooth and normal appearing except at the apex of the heart. In this region, the epicardium is raised, presenting a nodular area 1 cm. in diameter and projecting out from the heart 8 mm. When this mass and the heart are incised longitudinally the mass is found to be composed of caseous material projecting out from the myocardium. Microscopic sections, taken to include the entire thickness of the wall of the heart and the caseous lesion, show the mass to be made up of caseation necrosis in the centre, with a narrow rim of lymphocytes and a few giant cells. These lymphocytes are invading the outer half of the myocardium, but there is no extension beyond this line.

"A mass is found in the neck at the anatomical situation of the thyroid gland. This is soft in consistency, but rather firmly attached to the surrounding tissue. It is somewhat spherical in shape with an indentation along its posterior surface produced by the trachea. The mass lies more to the left of the trachea, which it had displaced to the right. The right border of the mass extends to the right border of the trachea. When the mass was opened it was found to be made up of caseous material. Attached to the right border of it and apparently continuous with it is a small portion of tissue 1 cm. in diameter, resembling normal thyroid gland. There is no other tissue found resembling thyroid gland. There are a few lymph glands in the left anterior cervical region, 1 cm. in diameter, not matted together and completely separated from this large caseous mass. These cervical lymph glands are caseous.

"Microscopic sections, taken through the large caseous mass in the neck, show a fibrous capsule with lymphocytes and a few giant cells beneath the capsule. The centre of the mass is made up of caseous material. A section taken through the junction of what appeared to be normal thyroid and the caseous mass shows in one-half of the section quite normal thyroid tissue. The

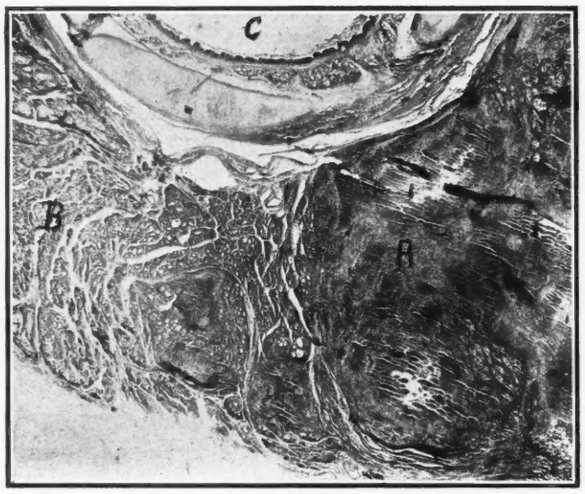

FIG. 4.—Section through neck, showing A. caseous material; B. thyroid gland; C. trachea.

remainder of the section shows destruction of thyroid tissue and replacement of this tissue by lymphocytes and endothelial cells. In places there is caseation necrosis. Tubercle bacilli were found in this tissue by special stains.

"Gross examination of the brain membranes and its external surface reveals no pathological changes. After fixation the brain was sectioned. A caseous area 3 cm. in diameter is seen in the right lobe 1 cm. from the surface of the brain and just anterior to the motor cortex. There are no other lesions seen in the brain."

Caseous tuberculous lesions were also found in the cervical, mediastinal, mesenteric and inguinal lymph glands, the kidneys, spleen and lungs.

SUMMARY

1. Tuberculosis of the thyroid gland is uncommon. About 255 cases have been reported in the literature, half of these revealed the condition in glands removed at operation.

2. The incidence of tuberculosis of the thyroid gland in the glands removed at operation is about 0.1 per cent.

3. There is no constant group of symptoms or physical signs.. Many show a moderate degree of hyperthyroidism.

4. The case we have presented shows three unusual manifestations of tuberculosis; caseous tuberculosis of the thyroid, a tuberculoma at the apex of the heart, and a large solitary caseous tuberculous lesion of the brain without meningitis.

We are deeply indebted to Dr. L. J. Rhea for the opportunity of presenting this case and for the helpful suggestions given in preparing this paper.

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DIPHYLLOBOTHRIUM LATUM (FISH TAPEWORM) INFESTATION IN EASTERN CANADA: WITH PARTICULAR REFERENCE TO ITS INCREASING PREVALENCE*

BY H. B. CUSHING, B.A., M.D., F.R.C.P.(C.) AND H. L. BACAL, B.A., M.D.,

Montreal

WITH the report by Leidy, in the United States, in 1879, that he had identified a specimen of the fish tapeworm taken from a Swedish immigrant, resident in Pennsylvania; and of Hamilton,[10] in Montreal, Canada, in 1901, that he had found a fish tapeworm, thirty-seven feet in length, in a French Canadian who had never dwelt outside Canada and rarely outside the province of Quebec, apparently the importation of the *Diphyllobothrium latum* infestation and the establishment of native infection was demonstrated in those early years. Further cases were reported by various authors, Nickerson[25] heading the list in 1911 with data on 65 from Minnesota, also including a second case of native infection; he had previously described a local case from the clinic of Dr. Parker in Ely, Minnesota, in 1906. To date, at least 300 cases have been reported on the North American Continent in foreign-born immigrants and natives from either the United States or Canada.

Endemic areas, where the fresh water fish are infected with the larvæ of the *Dibothriocephalus latus* have been proved to exist in most of the commercially important Canadian Lakes, such as the larger lakes of Manitoba, Lake la Biche in Alberta and the Great Lakes. The lake region of Minnesota and the upper peninsula of Michigan are also a source of distribution of this infestation.

Plotz,[27] in 1932, reported 20 cases from New York, these including 5 patients born in the United States, thus proving that the infestation has definitely spread to the eastern seaboard, and would surely be a source for disseminating the infection further. Apparently immigrants from the Baltic Area, Finlanders and Russian Jews are responsible for the first cases in North America. These have, probably through poor sewage disposal, improper means of control and ignorance of the mode of infection, further disseminated this infestation.

We have found here, as did Barron[2] and others, that the infestation is more prevalent in Jewish women and Finlanders, because each eat either raw fish, or a particular fish dish, which could harbour the fish tapeworm. On questioning infected Jewish housewives, we also found that while they prepared a dish

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commonly called "Gefüllte Fisch" or fish-balls, made from a mixture of onions with chopped white fish, suckers, doré, carp, pickerel, perch or pike, and rolled in the skin of these fish, some are in the habit of tasting the raw material before cooking, to see that it is properly seasoned with spices, pepper and salt, thus becoming infected. We were surprised, on questioning several Jewish housewives, to find that, instead of using caviar on toast or crackers as an entrée, they were in the habit, usually on Thursdays or Fridays, the days they usually prepared "Gefüllte Fisch", of using the raw chopped fish smeared on toast or crackers as an appetizing dish. This they called "Gefüllachtz" meaning "filling or dressing." As Magath[20] has described, the Finlanders became infected from eating raw fish

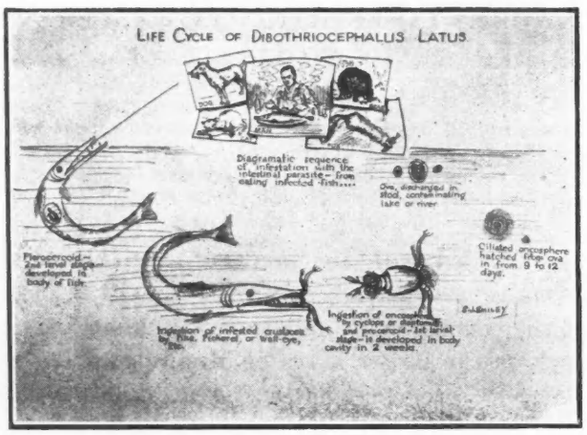
LIFE CYCLE OF DIBOTHRIOCEPHALUS LATUS
Diagramatic sequence of infestations with the intestinal parasite—from eating infected fish....
One, discharged in stool, contaminating lake or river
Ciliated oncosphere hatched from ova in from 9 to 12 days.
Procercoid—first larval stage—developed in body of fish
Ingestion of infested crustacea by fish, fisherai, or man-eye, etc.
Ingestion of oncosphere by cyclops or diaptomus and procercoid—1st larval stage—is developed in body cavity in 2 weeks.

FIG. 1

alone or from eating one of their favourite fish dishes, namely, fresh fish soaked in brine for twenty-four hours and then served with green peppers, cabbage or cucumbers.

It is interesting to note that no native cases have been reported in the Southern States. DeBuys and Dwyer,[7] in a study of stools of 595 inmates from seven institutions, found 317, or 53.27 per cent, infected with intestinal parasites, but none harboured the fish tapeworm. Essex[9] has shown that fish from the Mississippi river and its tributaries in the south are seldom if ever infested with the larvæ of the fish tapeworm, not necessarily because of the failure of the ova of the parasite to reach these rivers, but rather because of the absence of the proper intermediate host. The absence of cold water lakes is probably another factor.

Bajkov,[1] in discussing the general character of the plankton of the larger prairie lakes, mentions the genera for fish fry, among which is included the cyclops. Apparently the *Cyclops strenuus* is the first intermediate host in the European countries. He points out that in Lake Winnipeg and the other prairie lakes one of the principal species of the diaptom is the *Diaptomus sicilis*. The *Diaptomus oregoniensis, sicilis* and *siciloides* have been shown by Magath and Essex[19] to be the important factor in the first stage of the development of the fish tapeworm ova here.

The life cycle of the *Diphyllobothrium latum* is interesting but was not known completely until fairly recently. It begins with ova found in the stools of either man, dog, cat, fox, bear, wolf or lynx harbouring an adult fish tapeworm. The stool containing the ova is discharged as sewage and contaminates lakes or rivers. The ova hatch in nine to twelve days into the ciliated oncosphere. The oncosphere is ingested either by a cyclops or diaptom and is developed in the body cavity of either of these copepods two weeks after ingestion. This is known as the procercoid or first larval stage. The plerocercoid, or second larval, stage is developed in the body of various fishes such as pike, pickerel and perch, etc., either from eating infested young fish or eating the infected copepod.

The cycle is continued by the primary host, usually man, eating these infected fish. Thus a vicious cycle is maintained. This life cycle was first completely described by Janicki and Rosen in 1917. Magath[15] in 1927 first demonstrated that North American fishes acted as hosts for this worm. This finding was confirmed by Essex.[9]

Generally, the development of the worm is very rapid after infection, the average daily increase during the first five weeks being 31 to 32 segments. Eggs may appear in the fæces twenty-four days after infection in man, and in experimental dogs after three or four weeks. A person harbouring a fish tapeworm may expel into the sewage system about 1,000,000 ova daily. Re-infection may occur.

Several of the Jewish women who were in the habit of cooking "Gefüllte Fisch" have told us that on several occasions when stripping the skin from doré in order to mince the fish, they have found small white worms about one-quarter to one-half an inch in length. When

TABLE I.

FISH BOUGHT FROM MONTREAL FISH DEALERS EXAMINED FOR FISH TAPEWORM LARVÆ

Name of Fish	*Size in Inches*	*Where Caught*	*Comments*
1. Sucker	15	St. Lawrence River below Three Rivers	Negative.
2. Buffalo Carp	14½	St. Lawrence River (Lake St. Peter)	Negative.
3. Buffalo Carp	15	St. Lawrence River (Lake St. Peter)	Negative.
4. Pike	16½	St. Lawrence River (Lake St. Peter)	Negative.
5. Pike	16	St. Lawrence River (Lake St. Peter)	Negative.
6. Whitefish	9	St. Lawrence River	Negative.
7. Whitefish	8	St. Lawrence River	Negative.
8. Pike	14	Belleville, Ont., Bay of Quinté	Negative.
9. Pike	13¼	Belleville, Ont., Bay of Quinté	Several *Opisthorchis Sp.* and *Neolchinochynchus Sp.* were found in its intestines.
10. Sucker	13½	Belleville, Ont., Bay of Quinté	Negative.
11. Dore	16½	Lake Winnipegosis, Man.	Two larvæ of the fish tapeworm were found in the flesh. Other varieties of worms were found in the stomach and intestines. The stomach also contained a small fish 4 inches in length and partially digested.
12. Sauger	14	Delta, Man.	Small worms in gut—not identified.
13. Sauger	15	Delta, Man.	Small worms in gut—not identified.
14. Pike	16	Boucherville, St. Lawrence River	Negative.
15. Carp	9	Belleville, Ont.	Negative.
16. Carp	8¼	Belleville, Ont.	Negative.
17. Sauger	11	Lorraine, St. Lawrence River	Negative.
18. Sauger	9½	Lorraine, St. Lawrence River	Negative.

these were put on the warm palm of the hand they would move. Because of this many hesitated to use this fish, either for the special dish or for ordinary food.

To date, there is no direct evidence to prove that the fish caught locally contain the plerocercoid of the fish tapeworm. We have examined various fish caught in the St. Lawrence River in the manner outlined by Nicholson,[22] and have failed to find the fish tapeworm larvæ. However, reliable information from fish dealers in the city of Montreal, particularly the Jewish dealers, who stock the coarse type of fish, tell us that they import "Wall eyes", pike, pickerel, white fish and other varieties from the Manitoba Lakes and the Great Lakes when they are not in season here. These are probably the main source of our native infestation in Eastern Canada.

We were able to find two larvæ of the fish tapeworm in the flesh of a doré imported from Manitoba which was caught in Lake Winnipegosis and bought in Montreal at one of the fish stores.

Our study material consists of 50 cases of *Diphyllobothrium latum* infestation, admitted as patients to the three larger teaching hospitals of McGill University Medical School, in Montreal, between the years 1906 and 1933 inclusive. Thirty-two cases were admitted to the Royal Victoria Hospital, 11 to the Montreal General Hospital and 7 to the Children's Memorial Hospital. Infected persons attending the outdoor clinics of the above hospitals are not included in this study. The increasing incidence of infection is shown by the following Table.

TABLE II.

Year	*No. of Cases*
1906	1
1917	1
1919	1
1921	1
1923	1
1924	1
1926	3
1927	2
1928	2
1929	4
1930	7
1931	6
1932	8
1933	12

We were able to find here only 13 cases between the years 1906 and 1928 inclusive. The greatest increase is noted between the years 1928 and 1933, during which period 37 persons were admitted with the diagnosis of fish tapeworm, showing the rapid and progressive increase of this infestation in Montreal.

In spite of the better general public health supervision, as shown by the decreased quantity of thousands of pounds of fish condemned in Montreal between the years 1921 and 1933 because of being spoiled, mouldy, slimy or sour, there has been an increasing prevalence of this infection. However, we note that there is no provision by the health authorities to educate the public or to institute proper control measures for elimination of this infestation. The following Table shows the number of pounds of fish condemned in Montreal over a period of twelve years.

TABLE III.

Year	*Pounds of Fish Condemned*
1921	223,229 lbs.
1922	82,952 "
1924	98,854 "
1925	249,080 "
1926	29,192 "
1927	20,246 "
1928	16,214 "
1929	24,835 "
1930	36,020 "
1931	53,541 "
1932	64,018 "
1933 to October 1, 1933	46,755 "

The diagnosis of "fish tapeworm infection" was made by finding either the ova or segments of the *Diphyllobothrium latum* in the stools. Sex seems to play an important rôle in this infestation. Out of these 50 cases studied, 36 were in females and only 14 were in males. Various nationalities were infected. There were 31 Jews, of whom 30 were females. The other case was in a boy of eight years of age, born in Poland. His mother and maternal grandmother also harboured the fish tapeworm. All ate "Gefüllte Fisch". Fifteen of the Jewish patients were born in Russia, 9 in Canada, 4 in Roumania, 2 in Poland and 1 in Germany. There were 11 cases amongst Finlanders, all foreign-born. There was one Roman Catholic patient who was born in the United States and

TABLE IV.

Age in Years	*No. of Cases*
2	1
3	1
4	1
8	4
10	2
11	2
23	1
24	1
25	2
27	3
29	2
30	1
31	1
32	1
33	2
35	2
36	1
37	2
40	1
41	2
43	2
45	1
48	3
50	1
52	1
55	1
56	1
60	2
62	2
65	2
Unstated	1

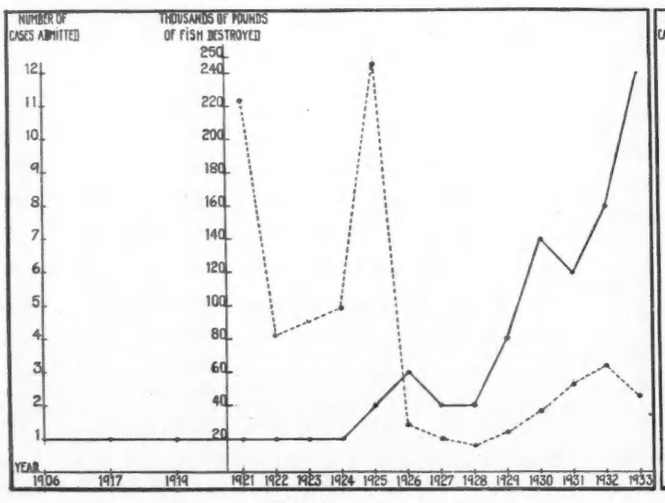

FIG. 2

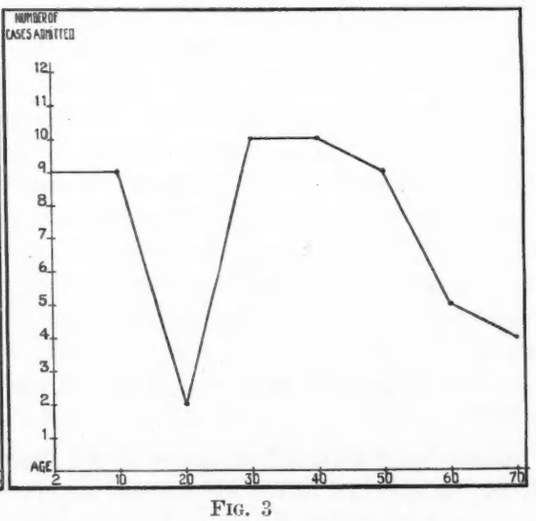

FIG. 3

FIG. 2.—Rate incidence of *Dibothriocephalus latus* in Montreal.
FIG. 3.—Age incidence of *Dibothriocephalus latus* in Montreal. Youngest case, 2 years of age; oldest case, 65 years; one case age not stated.

migrated to Canada at the age of five months. England was also represented by one case, a Protestant.

Twenty-nine of the total number of cases infected occurred between the ages of 21 and 50. Of these, 15 were in Jewesses. In the group from birth to ten years there were 9 infected cases. Of these 6 were of Jewish extraction and all but one were females. There were only 2 patients, each eleven years old, in the 11-20 year group. This is perhaps of significance, in that during this age period persons are not so likely to put food in their mouths which they may find here and there as in the younger years; also they have not reached the age at which they are cooks, so that they might become infected while tasting raw fish.

The youngest case was in a female Hebrew child, two years old, born in Canada.

CASE 1

E. Z. (No. 4449), a female, aged 2 years, Hebrew, was admitted to the Children's Memorial Hospital on July 20, 1932, with a history of having passed two feet of tapeworm in the stool six months prior to admission. She did not pass any again until July 18, 1932, when she passed 28 inches, which was identified at the Children's Memorial Hospital as the *Dibothriocephalus latus*. The head was not present. The patient had lost one pound in weight during the previous six months, and had had a poor appetite for three months. She was born in Canada, of Russian Jewish extraction. Physical examination was not remarkable.

The blood picture on July 20, 1933, showed red blood cells, 5,060,000; white blood cells, 10,500, and hæmoglobin 85 per cent. The stools contained segments and ova of the fish tapeworm.

On July 21, 1932, the patient was put on clear fluids and cleared with magnesium sulphate and a high saline enema, following which she was given male fern by nasal tube. This she vomited. However, she passed one foot of worm. The above régime was repeated on July 23, 1932, and this time the patient passed two feet of fish tapeworm with strobila and head attached. She was discharged on July 27, 1932.

The oldest patients in this study, were two females, each 65 years old. A brief summary of each case follows.

CASE 2

(R.V.H. Case No. 50809). A Hebrew female, born in Roumania, was admitted to the Royal Victoria Hospital on August 31, 1928, with no other complaints except that she had passed segments of tapeworm. Physical examination was not remarkable. The blood picture showed red blood cells 4,200,000; white blood cells 4,400; hæmoglobin 80 per cent. She was purged with magnesium sulphate and calomel, following which she was given male fern. Thirty-five feet of fish tapeworm, with the head intact, were passed. She was discharged on September 1, 1928.

CASE 3

(R.V.H. Case No. 59627). A Hebrew female, born in Russia, was admitted to the Royal Victoria Hospital on July 21, 1931, complaining of nausea, gnawing pain in abdomen, alternating diarrhœa and constipation, and the passage of worm segments in the stool. The physical examination was not remarkable. The blood picture showed red blood cells 4,010,000; white blood cells 7,200; hæmoglobin 70 per cent. She was purged in the usual way and treated with male fern. Yards of fish tapeworm were passed, but no head was identified. She was discharged on July 26, 1931.

The complaints were many and varied. Thirty-nine patients gave a history of having passed segments of worms in their stools. The diagnosis of fish tapeworm infection in the other 11 cases was made by routine examination of the stool.

Twenty-seven patients complained of fulness in the abdomen or of various types of abdominal pains, colicky, gnawing or crampy; 15 complained of being either tired or having a feeling of weakness; 15 had lost weight; 10 complained of belching; 9 complained of diarrhœa; 9 of pallor; 9 of poor appetite; 8 of headaches; 6 of vomiting; 6 of voracious appetite; 5 of constipation; 4 of dizziness; 4 of nausea; 3 of sleeplessness; 3 of itching about the anus; 2 of indigestion; 2 patients stated that they felt the worm crawling in their abdomen; 2 complained of having alternating diarrhœa and constipation; 2 complained of restlessness; 2 of nervousness; 1 of bad taste in the mouth; 1 of hiccough; and another of picking at the nose.

It is noteworthy that in the patients who had marked anæmia, the most prominent symptoms were weakness, headache, dizziness, pain in the abdomen, poor appetite and loss of weight.

A short summary of the cases with marked anæmia is given below.

CASE 4

A female, aged 29 years, born in Germany, was admitted to the Royal Victoria Hospital on July 2, 1906, complaining of headaches, loss of weight, nervousness, pain in the abdomen, weakness, vomiting, restlessness, and blood in the stools. She gave a history of having passed worms at intervals for sixteen years. She was extremely pale and jaundiced. The liver and right kidney were palpable. She had œdema of the legs and was dyspnœic. A systolic apical murmur was present and urobilin and acetone were present in the urine. The hæmogram on admission was red blood cells 1,290,000; white blood cells 6,800; hæmoglobin 30 per cent; polymorphonuclears 53 per cent; lymphocytes 46 per cent; eosinophiles 1 per cent. The red cells exhibited polychromatophilia and many were nucleated. Microcytes and macrocytes were also present.

Following treatment with magnesium sulphate and male fern, the fish tapeworm was discharged, but the head was not identified. The hæmogram on discharge was red blood cells 4,350,000; hæmoglobin 78 per cent. She was discharged on September 2, 1906.

CASE 5

A male, aged 23 years, born in Finland, was admitted to the Royal Victoria Hospital on September 15, 1925, and discharged on January 5, 1926, with symptoms of heart disease and tertiary lues. The hæmogram was red blood cells 1,850,000; white blood cells 3,500; hæmoglobin 25 per cent; polymorphonuclears 68 per cent; lymphocytes 20 per cent; eosinophiles 4 per cent; monocytes 5 per cent; myelocytes 3 per cent.

The patient was treated for tapeworm and the worm was passed, but the head was not identified.

CASE 6

A male, aged 33 years, born in Finland, was admitted to the Royal Victoria Hospital, on December 21, 1931, and discharged on March 6, 1932, with paratyphoid fever and fish tapeworm infection. The hæmogram was red blood cells 1,100,000; white blood cells 3,750; hæmoglobin 27 per cent. The patient was treated for the tapeworm infection. The worm was evacuated, but the head was not identified. No ova were found in the stools after treatment.

CASE 7

A male, aged 62 years, born in Roumania, was admitted to the Surgical Department of the Royal Victoria Hospital on November 7, 1932, and discharged on November 10, 1932. He complained of loss of weight, weakness and passage of segments of worm in the stool. Ova of the fish tapeworm were present in the stools. The benzidine reaction was positive for blood. The hæmogram was red blood cells 1,960,000; white blood cells 10,100 and hæmoglobin 70 per cent; polymorphonuclears 82 per cent; lymphocytes 18 per cent.

The patient was not treated. The final diagnosis was carcinoma of the stomach; *Dibothriocephalus latus* infestation and secondary anæmia.

CASE 8

A male, aged 32 years, Born in Finland, coming to Canada in 1923, was admitted to the Montreal General Hospital on April 3, 1928, and discharged on May 28, 1928. He complained of pain in the epigastrium and in the chest, and had been dyspnœic for the previous three weeks. He vomited and suffered from headaches, had lost twenty-four pounds in the last two weeks and felt weak. There was a history of passing worms in the stools in Finland. He was in the same hospital in March, 1927, with typhoid fever and *Streptococcus hæmolyticus* infection, necessitating transfusions. An x-ray of the chest showed evidence of an old tuberculous lesion. His blood picture on discharge was red blood cells 4,310,000; white blood cells 6,800; hæmoglobin 95 per cent.

Physical examination on the second admission showed a pale, undernourished individual, with a waxy skin. The papillæ of the tongue were atrophic. There was a soft systolic bruit, heard loudest over the mitral area. His blood pressure was 84/40. The urine was negative and the stools contained many ova of the fish tapeworm. The hæmogram on April 3, 1928, was red blood cells 1,250,000; white blood cells 2,750; hæmoglobin 24 per cent (H); polymorphonuclears 41 per cent; lymphocytes 54 per cent; monocytes 5 per cent; there was anisocytosis, poikilocytosis and chromatophilia, microcytes, normoblasts and megaloblasts and stippled red blood cells were present.

The patient was prepared in the usual manner and was treated with pelletierin tannate. Yards of worm were passed, but the head was not found. The patient was given liver extract, Blaud's pills and dilute hydrochloric acid. The hæmogram on May 25, 1928, was red blood cells 3,870,000; white blood cells 6,900; hæmoglobin 81 per cent (H).

CASE 9

A male, aged 25 years, born in Finland, coming to Canada in 1927, was admitted to the Montreal General Hospital on November 24, 1930, and discharged on December 26, 1930. He complained of loss of weight and pallor. Because of his inability to speak English a satisfactory history could not be obtained. Physical examination revealed a very pale man with skin waxy in appearance. His conjunctivæ had a subicteroid tint. There was a soft blowing systolic murmur at the apex, which was not transmitted. The blood pressure was 115/65. The axillæ, elbows, nipples and several scars were pigmented brown. The urine was negative; the stool contained many ova of the fish tapeworm. The hæmogram on admission was red blood cells 900,000; white blood cells 6,700; hæmoglobin 25 per cent (H); colour-index 1.4; polymorphonuclears 20 per cent; lymphocytes 68 per cent; eosinophiles 5 per cent; monocytes 3 per cent; myelocytes 4 per cent.

After the administration of castor oil and an enema, the patient was given male fern, followed by black draught. The above treatment was repeated on November 30th and two worms were passed, but no heads were obtained. The patient was put on an anæmia diet and given Blauds pills and copper and iron capsules. The hæmogram on November 30th was red blood cells 2,095,000; white blood cells 5,900; hæmoglobin 58 per cent; colour-index 1.3; polymorphonuclears 33 per cent; lymphocytes 49 per cent; eosinophiles 2 per cent; monocytes 2 per cent; myelocytes 2 per cent; on December 16th, red blood cells 3,230,000; hæmoglobin 70 per cent; colour-index 1; polymorphonuclears 65 per cent; lymphocytes 30 per cent; eosinophiles 2 per cent; monocytes 1 per cent; myelocytes 1 per cent. A gastric analysis showed no free hydrochloric acid and the total acid was 16.

CASE 10

A male, aged 31 years, born in Finland, coming to Canada in 1925, was admitted to the Montreal General Hospital on March 15, 1933, and discharged on April 7th. He gave a history of having passed tapeworm segments in the stool since he could remember. He had been treated for this condition twelve years previously without being relieved of the worm. Eleven months prior to admission he began to complain of mid-epigastric pain, which was dull in character. He tired easily and had been getting pale for the previous two years, with loss in weight of fifteen pounds in the last six months. His appetite was good until four weeks before when it became poor. The taking of solid food gives him diarrhœa. Physical examination was not remarkable, except that he was very pale and the papillæ of his tongue were atrophic. The urine was negative and the stools contained many ova of the fish tapeworm and segments. A gastric analysis was done. There was no free hydrochloric acid and the total acid was 10. The hæmogram on March 16th was red blood cells 1,910,000; white blood cells 6,800; hæmoglobin 38 per cent; and on March 18th—red blood cells 2,100,000; hæmoglobin 44 per cent; polymorphonuclears 54 per cent; lymphocytes 36 per cent; eosinophiles 7 per cent; monocytes 3 per cent; polychromatophilia, anisocytosis and poikilocytosis. The patient was purged with magnesium sulphate in the usual way on March 19th and was given male fern. He vomited and the anthelmintic was repeated. The worm was passed with the head intact. The patient was given dilute hydrochloric acid and the anæmia was treated with iron orally and liver extract was administered intramuscularly.

The hæmogram on March 31st was red blood cells 3,130,000; hæmoglobin 64 per cent (S). The reticulated red blood cells were 1.6 per cent. The hæmoglobin rose to 71 per cent (S) and the reticulated red blood cells fell to 0.5 per cent on April 5th.

TABLE V.

HÆMOGRAMS OF FORTY CASES

Red Cells	*White Cells*	*Hæmoglobin Percentage*	*Colour Index*	*Polymorphonuclears*	*Lymphocytes*	*Eosinophiles*	*Monocytes*	*Myelocytes*
4,110,000	8,400	75	0.91	58	35	4	3	
4,130,000	9,200	82	0.99					
4,290,000	3,900	78	0.90					
1,290,000	6,800	30	1.15	53	46	1		
4,100,000	7,200	82	1.00	68	28	3	1	
5,100,000	6,200	83	0.81	69	26	1	1	3
1,910,000	6,800	38	0.99					
4,230,000	6,040	70	0.82	58	37	1	3	1
4,200,000	10,100	75	0.89	33	66		1	
5,400,000	7,200	90	0.83	65	30	5		
5,700,000	7,300	92	0.80	74	22	1	3	
4,120,000	7,800	75	0.91	70	22	7	1	
900,000	6,700	25	1.40	20	68	5	3	4
1,250,000	2,700	24	0.96	41	54		5	
3,600,000	9,000	70	0.97	50	50			
5,060,000	10,500	85	0.84	68	32			
4,890,000	8,750	75	0.76	65	30		5	
3,340,000	8,600	90	1.34					
4,600,000	7,600	70	0.98					
4,410,000	9,700	85	0.96	64	27	4	5	
4,580,000	7,250	88	0.96	49	35	11	5	
1,960,000	10,100	70	1.78	82	18			
4,105,000	6,800	75	0.91					
1,110,000	3,750	27	1.21					
4,010,000	7,200	70	0.87					
4,720,000	7,800	90	0.95					
4,875,000	8,900	98	1.00	65	28	2	5	
4,520,000	7,000	80	0.88	43	44	6	7	
4,050,000	8,600	70	0.86	67	31	1	1	
4,550,000	11,050	80	0.88	66	24	6	4	
4,800,000	10,400	70	0.73					
4,400,000	12,100	75	0.85	51	46		3	
4,900,000	8,200	72	0.73					
4,680,000	6,200	90	0.96	68	24	7	1	
4,200,000	7,400	84	1.00	71	26	3		
4,200,000	4,800	80	0.95					
3,350,000	13,300	70	1.04					
4,850,000	6,500	75	0.77	76	22	2		
3,770,000	5,150	75	0.99					
1,850,000	3,500	25	0.67	68	20	4	5	3

The similarity of Dibothriocephalus anæmia to cryptogenetic pernicious anæmia has been observed and discussed by many writers. It is often difficult to distinguish it from pernicious anæmia clinically, hæmatologically and pathologically. It is noteworthy in several of our cases that with the expulsion of the worm and iron and liver therapy there was a rapid improvement of the blood picture.

Anæmia was not the rule in our series of cases, but when it occurred, it was severe. Eosinophilia was not a feature. The eosinophile count varied from 0 to 11 per cent. A list of the hæmograms of 40 cases is given above.

Various anthelmintics were used, namely male fern, kamala, pelletierin tannate and santonin. The cathartics used were magnesium sulphate, calomel and soda, black draught and A.B.S. and C. pills, castor oil, croton oil, cascara and senna.

The results of treatment were as follows:

Worm passed	41	cases
Worm not passed	6	"
Not treated	2	"
No data	1	"

The head was recovered and identified in 12 cases. One patient passed two worms and the heads of the *Dibothriocephalus latus* were identified in both. One patient had multiple infection of *Diphyllobothrium latum; Tænia saginata, Ascaris lumbricoides* and *Endolimax nana;* another patient also had pin worms. Loss of weight during treatment was a feature.

We will report in a subsequent communication details of 12 Canadian native-born cases.

CONCLUSIONS

Fish tapeworm infestation is a preventable disease. With proper public health measures it can be curbed and completely eradicated. The disease should be a reportable one, and infected persons should be required to have treatment until their stools are ova-free. The public health authorities should make a survey of the various infected areas, examine fish and educate the fish dealers and the buying public regarding the danger of eating raw, smoked or partially cooked fish. Fish stores should have placards on their walls to this effect. A periodic examination by public health inspectors should be made of samples of possible offending fish, taken from the various fish stores, just as is done with milk. Newspaper publicity; warnings from the clergy to their respective congregations would result in a rapid dissemination of the dangers of eating raw fish.

Sewage should not be emptied into lakes or streams without being first treated with some disinfecting solution.

We wish to express our appreciation to Dr. J. C. Meakins, Physician-in-chief to the Royal Victoria Hospital and Dr. C. P. Howard, Physician-in-chief to the Montreal General Hospital for allowing us the use of the Medical case records. We also wish to thank Dr. L. J. Rhea, Pathologist to the Montreal General Hospital and Dr. A. J. G. Hood, Director of the Division of Food Inspection of the City of Montreal for their helpful suggestions.

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Note. A more comprehensive bibliography can be obtained on application to the authors. Birkeland's article (No. 3 *supra*) contains very full references.

A Scottish doctor of the seventeenth century has attained a rare brand of immortality. *Science Service* reports that Indians of the Tule tribe in Panama have made him their god of medicine, and his cult is spreading to other tribes two hundred years after his death. As evidence of this, the Smithsonian Institution has almost a dozen wooden canes, the kind used by Indian medicine men in their healing ceremonies, every one carved with the unmistakable features of Dr. William Patterson. This Scottish god of medicine is distinguished by a long nose, a high top hat, and a coat of green or black. Investigation reveals that Dr. Patterson was leader of a Scottish colony which came to the coast of the Gulf of San Blas in 1698, intent on trade with the Indians. He won the esteem and friendship of the Indians by his great success in treating their sick. After a time the Spaniards objected to the Scottish colony, feeling that it encroached upon their preserves. Dr. Patterson and his followers departed, leaving with the Indians only the memory of the greatest medicine man they had ever known. In time the doctor came to be thought of as a god who had once lived in their midst, and his figure carved in wood became magic to aid Tule doctors in their work.—*The Diplomate*, 1933, **5:** 184.

HYMENOLEPIS DIMINUTA (RAT TAPEWORM) IN MAN

WITH THE REPORT OF A CASE

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IN view of the fact that infestation of man with the rat tapeworm is rare, it seems desirable to report a case which, so far as can be ascertained, is the first to be recorded in Canada.

DISTRIBUTION OF REPORTED CASES

Sixty-six cases of human infestation with *Hymenolepis diminuta* have been reported. A reference to these shows a wide distribution throughout the world as follows:— Brazil 19 cases, United States 18, India 8, Sicily 4, Nicaragua 3, Africa, West Indies and Italy 2 each, and Japan, Argentina, Philippines, France and Belgium 1 each. In 3 instances the country was not given.

CASE HISTORY

Baby M., a female, aged 19 months, was admitted to St. Joseph's Hospital, on October 18, 1933, with the history that she had been somewhat fretful and that the parents had noticed portions of worms in the stools. The leucocytes numbered 10,000 per cmm., with a normal differential count. There was no increase of eosinophiles. The child was given one dram of the oleoresin of male fern through a stomach tube, followed in 30 minutes by a saline purgative. A subsequent simple enema was returned with 40 tapeworms. An examination of the worms revealed ten heads. The child was taken home and the parents instructed to send in samples of stool every week. On November 27th, five weeks after returning home, ova were found in the stool. The child was re-admitted to hospital and the medication repeated. She was unable, however, to retain the oleoresin, the major portion being vomited. In 24 hours several small portions of tapeworms varying in length from 5 to 8 cm. were recovered. The segments were very small and appeared partially digested. No heads could be identified. The child is being kept under observation and the vermifuge will be administered again in due course.

DISCUSSION

In 1904 Ransom[1] wrote an exhaustive monograph on the genus Hymenolepis, a group of tapeworms commonly overlooked but which occasionally infest man. In this monograph the life-history of *Hymenolepis diminuta,* the rat tapeworm, is well presented and numerous illustrations are given. He gives a synopsis of 12 cases recorded in the literature, and states that the first case of human infestation was recorded by Weinland in 1858. In 1921 Riley and Shannon[2] reported a case in Minnesota, and referred to 49 case-records since 1904, one of which resulted from deliberate human experimentation. Since 1921, five cases have been reported;[3 to 7] with the case reported herewith 67 cases of human infestation with the rat tapeworm have been reported to date.

LIFE CYCLE

Various species of rats normally serve as the definitive host for this parasite. Rat infestation is common throughout the world, but investigation has shown that the incidence varies considerably in different countries. The incidence of rat infestation according to various observers is as follows:— Minnesota 14 per cent (Shannon), Algeria 18 per cent (Joyeux), Italy 20 to 30 per cent (Grossi), Norway 55 per cent (Brumpt), and Salonica 60 per cent (Joyeux). Peculiarly enough, the incidence of human infestation appears to be in inverse ratio to the incidence of rat infestation, as the distribution of human cases shows.

One or more parasites may reside in the same host, the head usually being attached to the lower portion of the small intestine. Upon disintegration of the gravid segments, the ova are liberated, and may be found in the stools. A large group of meal-infesting insects act as the intermediate host, but Joyeux considers the rat flea and the adult *Tenebrio molitor* (beetle) the natural intermediate hosts because of their distribution being similar to that of the rat, and because they appear to be readily infested. The ovum is ingested by the insect and the cercocystis develops in the body cavity.

The host becomes infested by the ingestion of one or more insects which contain the cercocystis in their body cavity. The cercocystis when fully developed is only a fraction of a millimetre in diameter, and consists of a minute cyst in which is attached a fully developed tapeworm head with rudimentary neck. Upon entering the

gastro-intestinal tract, the cyst wall disappears, and the head becomes attached in the lower portion of the small intestine. Experiment has shown that segments develop rapidly and that ova may be found in the stool about three weeks after the head becomes attached.

The tapeworm varies considerably in length, averaging 35 to 45 cm. The head is 300 to 600 microns in diameter, somewhat globular, and requires magnification for definite identification. Examination reveals four rounded, pigmented suckers, placed somewhat anteriorly, and a rudimentary unarmed rostellum. The neck is very short and usually smaller than the head, resembling a coarse white thread. The segments vary in size, but are exceedingly short, there being approximately 25 segments to a centimetre. The posterior border of each segment is slightly longer than the anterior border, producing a fine serrated edge. The genital pore is marginal, unilateral, and is placed on the left side of the segment. The young segments are colourless, but the distal gravid segments may contain a yellow or brownish spot due to distention of the uterus with ova. (*H. flavopunctata*, Weinland, 1858). When man is infected it is of interest to observe that many segments remain sterile.

Ova may appear in the stool about three weeks after the cercocystis is ingested. As seen in the stool or older segments they are spherical and approximately 60 microns in diameter. The embryo, which contains three pair of hooks, is surrounded by three membranes. The inner is thin, somewhat oval in shape, and closely invests the embryo. The middle membrane is thick, colourless, firmly granular in structure, and apparently albuminous in character. The outer membrane is rather thick, firm, yellowish in colour, and shows fine radial striations. This radial striation is only observed in fully developed ova.

SUMMARY

1. A case of human infestation with the rat tapeworm, *Hymenolepis diminuta*, is reported.

2. The case is of interest in view of the fact that there is no record of a previous case in Canada, and in all the literature no record of a case so heavily infested.

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MERCURIAL POISONING*

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THIS paper was prompted by three recent experiences with acute mercurial poisoning in this hospital. In one case, a physician, the poisoning followed the use of mercury-containing lozenges for the treatment of a sore throat; in the second case it was due to application of solutions of mercuric chloride to the feet for the treatment of a pyodermal infection; and in the third case it followed accidental ingestion of mercuric chloride tablets which were mistaken for aspirin.

In the following Table are recorded 309 cases of poisoning in the Montreal General Hospital, since analysis of poisons has been part of the routine duties of the Department of Metabolism.

It will be observed that mercurial poisoning is fifth in the list with respect to frequency. Of

TABLE I.

Poison	*No.*	*Poison*	*No.*
Alcohol	30	Luminal	3
Arsenic	14	Lye	4
Belladonna	2	Lysol	5
Benzene	1	Mercury	27
Bromide	4	Methyl alcohol	4
Carbolic acid	8	Morphine	48
Carbon disulphide	1	Naphthol	1
Carbon monoxide	36	Nicotine	1
Chloral	1	Opium	9
Chlorine	2	Oxalic acid	1
Cocaine	5	Paraldehyde	1
Creosote	5	Phosphorus	1
Food	8	Potassium iodide	1
Heroin	10	Ptomaine	3
Hydrochloric acid	1	Strychnine	5
Iodine	1	Tin	1
Lead	58	Veronal	7

* From the Department of Metabolism, The Montreal General Hospital, Montreal.

the 27 cases of mercurial poisoning, 23 were due to ingestion of mercuric chloride tablets; 2 were due to mercuric chloride douches; 1 to application of a mercuric chloride dressing to the skin for the treatment of a pyodermal infection and 1 to the use of mercury-containing lozenges. Of the 23 cases of poisoning due to ingestion of mercuric chloride tablets, there were 9 in which the tablets were taken with suicidal intent. These are of no particular interest here; more important is the fact that in 14 cases—an incidence of approximately 61 per cent—the poisoning was *accidental*, and the history was essentially the same in every case; the tablets were mistaken for "aspirin" or for some other drug used for similar purposes.

It would appear that there is no legislation, Federal or Provincial, to prevent such errors. The Food and Drugs Act administered by the Department of Pensions and National Health makes provision for the enforcement of standards of quality and requirements of labelling of medicinals, but the classification of certain drugs as poison is a matter which has been left to Provincial legislation.* That there is precedent for appropriate legislation is shown in the practice with respect to carbolic acid. In the Pharmacy Act of the Province of Ontario, for example, details are specified for containers in which carbolic acid containing more than 5 per cent phenol shall be sold; the bottles to be used for this purpose are such that they are distinguishable by touch *without attention to labels*. Thus:—

THE PHARMACY ACT, (Ontario), R.S.O. 1927, Chap. 199.

In addition. . . . carbolic acid, above a five per cent solution, shall not be sold by retail except,—

(a) In a glass bottle of light blue colour having six sides, the front being of plain surface, upon which the label shall be placed, and two of the opposite sides having blown on them the words "poison", "use with caution", and prominent points on the other portion of the surface thereof in such manner as to render the bottle distinguishable to the touch from ordinary bottles, etc.

All forms of mercury, when not properly employed, may be harmful. Intelligent use of the different therapeutic preparations depends upon recognition of the many factors which may influence toxicity. The purpose of this paper is to discuss these factors.

* H. M. Lancaster, Chief Dominion Analyst of the Department of Pensions and National Health, Ottawa, Canada. Personal communication.

HISTORICAL

In his monograph on the Arts of the Ancients, Neuberger[1] states that mercury was known to the ancients and used for the preparation of pigments as early as 2000 B.C. Quicksilver has been mined in Spain since Roman times and mercurialism was known then; Pliny, the Elder, mentions mercurialism in his description of the diseases of slaves.[2] Until recent years, mercury was used widely in industry, especially in the fur and felt industry; in fire gilding; the silvering of mirrors and the manufacture of dry batteries. Other substances, silver nitrate especially, have now largely replaced mercury in the silvering of mirrors. Mercury amalgam is still used to some extent for the extraction of gold and silver from the richer ores and in the solder of dry batteries, in the manufacture of scientific instruments (thermometers, barometers, etc.), and in production of antifouling paints for ship bottoms. Dentists are still liable to chronic poisoning owing to the continual handling of amalgam; traces of as much as 0.16 mg. of mercury have been reported in 24-hour samples of urine.[3]

Though its use in industry is decreasing, interest in mercury, clinically, has not only not diminished but is increasing, firstly, because of its medico-legal importance, and secondly, because of its wide and increasing application in therapeutics.

THE METABOLISM OF MERCURY

In spite of the voluminous literature, relatively little is known of the factors which govern the absorption and distribution of mercury in the body, its storage and elimination. This is due largely to the inadequacy of the methods for determining extremely minute amounts quantitatively. However, sufficient is known of the various mercurial preparations to permit intelligent selection.

Absorption. — Mercury is readily absorbed from all surfaces, including the intact skin. Signs of acute poisoning have been noted within 24 hours after use of ointments.[4] The readiness with which mercury may be absorbed from the skin is the basis for the use of inunctions. These, for some time, were the only reliable anti-syphilitic remedies. They were, however, objectionable, not only because they were dirty and time-consuming but because dosage was uncertain. Though still used for this pur-

pose, mercury has largely been replaced by bismuth, the sulphide of which is less toxic, and, therefore, has a lesser tendency to cause stomatitis. The organic mercurial compounds may also be absorbed from the skin. Contrary to the belief that mercurochrome does not penetrate normal living tissue,[5] that in the skin it is fixed in the stratum corneum, the writer has had no difficulty in detecting mercury in the fæces within 48 hours after the healthy intact skin (abdomen) was painted with this mercurial compound.*

Disease or injury of the skin facilitates absorption of mercury. Signs of acute poisoning have been noted as early as one-half hour after application.[6] This explains the rapidity with which acute poisoning developed in our case in which mercuric chloride was applied to the feet for the treatment of a pyodermal condition. Injury to the skin (due to scratching) also explains the frequency of stomatitis following the treatment of pediculosis corporis with mercurial ointments; Unguentum hydrargyri B.P. (the preparation ordinarily used) contains about 30 per cent metallic mercury. The treatment of pediculosis corporis is thus more likely to cause poisoning than the treatment of syphilis where the skin is, as a rule, intact. Injury to the skin also explains the stomatitis occasionally seen following the use of calomel-containing dusting powders for the treatment of slowly healing ulcers. This compound, otherwise quite harmless, is readily absorbed through broken skin and converted in the body into a more soluble and ionizable and thus more toxic compound.

Mention may here be made of a recently reported case of 'traumatic mercurial poisoning''.[7] In this case, poisoning occurred in a nurse from injury to her hand by breaking a thermometer. The author suggests that primary closure of such wounds is inadvisable; that attempts at squeezing or massaging are injurious, as they lead to a finer division of mercury particles; that every attempt should be made to remove the mercury completely; even the smallest amounts are not to be disregarded. From histological studies of the infiltrated tissues the logical treatment appears to be excision of the tissue involved. Removal of mercury which is not visible may be assisted by amalgamation, by placing a copper wire in the incision.

When taken by the mouth, a number of conditions influence the entry of mercury into the body. In addition to ordinary solubility, there are (a) the possible changes at the point of contact of the mercury with the gastrointestinal mucosa, and (b) the changes which may occur during absorption. Calomel (mercurous chloride), for example, a compound highly insoluble in water and almost insoluble in the stomach, when it reaches the duodenum may readily be converted into soluble forms of mercury, owing to the alkaline pancreatic juice; it may be converted into mercuric chloride. The mercuric chloride may then follow one of two courses. It may precipitate the proteins at the point of contact with the gastrointestinal mucosa and form insoluble albuminates. These may then remain insoluble and not be absorbed. On the other hand, because of excess protein and the presence of sodium chloride, the insoluble albuminate may go into solution and thus be readily absorbed.

Fine division aids absorption, especially through the lungs. It is of interest here to note that mercury, though a metal, is a liquid at ordinary temperature and vaporizes even at a temperature at which water freezes. Poisoning in the fur trade is largely due to vapours (fumes of mercuric nitrate).

Distribution.—Having entered the body, the course may be irregular. Much mercury may remain localized in the tissues owing to formation of insoluble compounds. This explains the very slow elimination noted at times. Fixation in the tissues offers an explanation of the relapses noted in the past when mercury was the chief agent in the treatment of syphilis. Such relapses were noted when the body apparently contained much mercury. Solution favours diffusion. Copper albuminate, for example, is not appreciably soluble in sodium chloride and protein solutions, and is, therefore, not very toxic.

The type of compound influences distribution. For example, according to roentgenographic studies following intramuscular injection,[8] mercury salicylate diffuses more rapidly than calomel, and the latter diffuses more readily than metallic mercury. Recognition of this fact is important clinically, in view of the possibility of cumulative effects with repeated injections.

* Unpublished data.

Mercury may be very widely distributed. It may reach all the tissues of the body, including the brain. This is probably due to the fact that the albuminate which mercury forms by combining with protein is soluble in the alkaline chlorides of the body fluids. The findings are not, however, always uniform.*

The distribution appears to be the same, regardless of the mode of entry. Clinical proof of this is the fact that ulceration of the gastro-intestinal tract is common, whether the mercury is taken by mouth, whether it has entered through the lungs, whether it was injected or whether it was applied to the skin. Mercury also appears in the saliva, regardless of its mode of entry; stomatitis is common in all forms of poisoning. Mercury readily passes into the placental circulation.[8] Abortion was common in the epidemic following a fire in one of the quicksilver mines in Idria, Austria.[2]

Elimination. — According to radio-chemical technique[9] mercury behaves somewhat like lead and bismuth with respect to elimination; it appears to remain longest in the liver and bones, and its storage is probably influenced by the same conditions which govern storage of these somewhat chemically allied metals. For example, its excretion appears to be depressed by administration of calcium and increased by administration of ammonium chloride.[10] Potassium iodide appears to diminish its deposition in the liver.[11] Its elimination is very slow; it may be months before the body is quite free. This is probably due to its combination with protein, to form fixed, insoluble, compounds. The writer has found it in fæces long after all clinical signs have disappeared, including albuminuria. Though it is excreted by the intestines chiefly, and to some extent by the kidneys, all the glands, salivary, intestinal, gastric, and sweat, aid in its excretion and it is the effects of the mercury upon these excretory organs which account largely for the clinical signs and symptoms of poisoning. Elimination is not necessarily influenced by deposition. In acute poisoning, for example, the mercury tends to concentrate in the kidneys, though little may be excreted in the urine.

Action.—Mercury may cause death in a number of ways. Its action may be local or general, or both. Though massive kidney damage terminating in uræmia is the commonest form, it may in large doses cause death by shock within one-half hour.[12] It may also cause death quickly by direct action upon the heart.[13] Emesis following intravenous injection of mercuric chloride is believed by some to be due to reflex action on the heart, and mercury salts have been found to affect the vagus. Administration of calcium alters the response of the heart to mercury.

The local action of mercury is corrosive. This is partly due to precipitation of protein, and partly to the fact that a mercury salt, as a result of hydrolysis, gives off acid which also exerts a corrosive action. Like most salts of heavy metals, mercury produces precipitates with protein, forming metallic albuminates, and, in combining with these metals, the proteins behave like acids. While insoluble, these albuminates are generally non-toxic or only slightly toxic. Though the albuminate which forms during protein precipitation may, as stated, readily dissolve in the alkaline chlorides in the blood and thus permit the poison to reach the general circulation and be widely distributed, these albuminates may, at times, be protective; they prevent further absorption of the mercury. This is the reason egg-white is administered in acute poisoning when the mercurial compound is taken by mouth. The protective mechanism of the albuminate explains the course of events in one of our cases. This patient (No. 1709/28) inserted a mercuric chloride tablet into the vagina and recovered in spite of an acute gangrenous vaginitis with extensive sloughing of the tissues. Owing to the formation of an insoluble albuminate, the poisoning remained localized. The general systemic effects were slight.

The possible harmful effects of even weak solutions of mercuric chloride are not generally recognized, judging from the common use of mercuric chloride douches. Mercuric chloride is a powerful protoplasmic poison. Spermatozoa are thus readily immobilized. The following data were obtained in experiments with rats.[14]

TABLE II.

Reagent	*Concentration necessary for immobilization*
Mercuric chloride	0.0003 per cent
Potassium permanganate	0.004 "
Phenol	0.07 "
Quinine	0.6 "
Alum	0.8 "

* In a recent case of acute poisoning in St. Luke's Hospital in Montreal, though the blood, urine and vomitus contained large quantities of mercury, I was unable to detect any in the cerebrospinal fluid.

The chief danger of mercuric chloride douches is the difficulty of predicting possible harmful effects owing to the many factors which may influence absorption from the vaginal mucosa. Cases, such as the one reported above, in which the formation of insoluble albuminate acted as a protective mechanism against absorption of mercury, are very exceptional. Even on intact, healthy, skin solutions of 1 in 1,000 dilution have been known to produce systemic poisoning. A 1 per cent solution readily produces irritation, vesiculation and corrosion, and when the skin is injured by trauma (scratching) or disease even a 1 in 20,000 solution, when left long enough, has been known to cause poisoning. The surfaces of mucous membranes are still more vulnerable. Rapid entry of poison into the body from the vagina is further aided by the rich lymphatic supply and local acid reaction. Hyperæmia — a common condition owing to local inflammatory disease — aids rapid absorption. Hyperæmia is also induced when solutions used for douching are hot. Aside from acute poisoning, mercuric chloride douches may be harmful. These may, at times, explain a cachexia, nervous symptoms, albuminuria and low grade anæmia which resist treatment. Mercuric chloride, as do the heavy metals in general, readily attacks red blood cells and speedily impairs their vitality.

THE TOXICITY OF MERCURIAL COMPOUNDS

If the ordinary mercurial compounds used in medicine are grouped in order of toxicity a striking fact is brought out; toxicity is not related to the amount of mercury administered. It appears to be related to solubility. Mercuric chloride, highly toxic, is at the head of the list; whereas, calomel (mercurous chloride) almost non-toxic, is second to last, and metallic mercury, practically innocuous, is last on the list. Solubility, however, is not the only influencing factor. For example, both "novasurol" and "salyrgan" are more soluble in water than mercuric chloride,* but, compared with mercuric chloride, they are not very toxic. A contributing, and at least equally important, factor is ionization. If the compounds are listed in order with respect to ionizability of the mercury, it is again found that mercuric chloride is at the head of the list† and calomel and metallic mercury are at the bottom. Thus, in general, toxicity parallels ionizability. Mercuric oxycyanide, for example, is poorly ionizable and may be applied to very sensitive mucous membranes (conjunctiva, etc.) with little or no irritation in concentrations of 1 in 500 to 1 in 1,000, whereas mercuric chloride, even in 1 in 20,000 dilutions, may be very irritating. "Metaphen" ionizes less than mercuric chloride; "novasurol" ionizes less than metaphen; "mercurochrome" ionizes less than novasurol and calomel ionizes less than mercurochrome. It is of interest to note also that there is a remarkable parallelism between the degree of ionization of mercuric compounds and their antiseptic action upon yeast cultures.

Ionization offers an explanation of the toxicity noted at times with calomel, an almost insoluble‡ and innocuous substance, under suitable conditions; calomel (*mercurous* chloride) may, as stated previously, be converted into the more soluble and ionizable *mercuric* chloride. This also appears to apply to the organic mercurial compounds. To become toxic, organically bound, and non-ionizable mercury must apparently be converted into free inorganic and ionized mercury. This probably explains the stomatitis and other signs of toxicity occasionally seen with mercurochrome, a compound in which the mercury is ordinarily firmly bound. The diuretic action of such mercurial compounds as salyrgan and novasurol may be explained largely on this basis. Though there is much to suggest some extra-renal influence, the data tend to support the view that the organic mercurial compounds exert their diuretic action through liberation and dissociation of small amounts of inorganic mercury. Suggestive is the fact that both salyrgan and novasural, administered in suitable doses, cause tubular and glomerular nephritis. Sollmann[8] states that the toxicity of organic compounds with firmly-bound mercury fairly parallels their efficiency in syphilis. An analogy is suggested in experiences with

* Both "novasurol" and "salyrgan" are marketed in ampoules as 10 per cent solutions. A saturated solution of mercuric chloride at room temperature contains less than 6 per cent of this salt.

† As Sollmann[8] points out, though the ionization of mercuric chloride is not very high, it can apparently replace ions very readily and thus behaves chemically as if it were highly ionized.

‡ 100 c.c. of a saturated solution of calomel at room temperature contain about 0.000038 grams only.

arsenic. Novarsenobenzol contains approximately 30 per cent arsenic. An ordinary dose (0.6 grams), therefore, contains a little over 2 grains of arsenic — the smallest recorded fatal dose of arsenic. In spite of this, as is well known, this organic compound of arsenic may be administered fairly frequently without any apparent harm. This is probably due to the fact that very little inorganic arsenic is liberated. Liberation of more than the usual quantities may explain the occasional case of poisoning.

Free inorganic and ionizable mercury also offers an explanation for the cathartic properties of mercurial compounds. Calomel, as is well known, has been used for this purpose for many years, and though it may be one of the least soluble and least ionizable of mercury compounds, part of it under suitable conditions may readily be converted into the more soluble and more ionizable mercuric compounds. These irritate the intestines and thus increase peristalsis.

Toxicity is not necessarily always due to the formation of soluble albuminates. A heavy metal forming a difficultly soluble albuminate, finding its way into the organism in organic combination so that it cannot precipitate protein, is not necessarily non-toxic. It may be as poisonous as mercuric chloride or nearly so. Copper tartrate is an example. Intravenous injection of 20 milligrams of copper tartrate causes death in an adult rabbit.[15]

As is well known, metallic mercury in bulk was used for many years, having been administered in doses of as much as 100 to 500 grams. Under ordinary conditions it usually passes off by the fæces with very little effect. Under suitable conditions, however, part of it may be converted into a soluble and an ionizable and, therefore, toxic compound. This explains the occasional diarrhœa and stomatitis, and also the occasionally fatal case. Interpretation is, at times, difficult. Of interest here is the trial for murder by poisoning at the Armagh Assizes.[12] Analysis of the viscera of the deceased showed the presence of over 286 grains of metallic mercury. It was, however, proved in the evidence that one of the accused had purchased, in addition to the metallic mercury, 10 grains of strychnine two days before the death of the deceased. The medical evidence was that death was due to strychnine poisoning. The stomach contained one-seventh of a grain of strychnine.

The favourable effects of organic mercurial compounds in septicæmia appear to depend, to some extent at least, upon "shock reaction." Diuresis, cathartic action and antiseptic properties appear, however, to depend largely upon conversion of the organic compound into a soluble inorganic and ionizable compound. Does this also apply to anti-syphilitic action? Very suggestive is the fact that such compounds as salyrgan and novasurol, though administered intravenously, have been found to be unreliable in the treatment of syphilis. Metallic mercury, a much more insoluble compound, is more effective. Its conversion into a soluble and ionizable mercuric compound in the body apparently takes place with greater ease than the liberation of mercury from those organic compounds in which it is so firmly fixed. It will presently be shown that the body can alter the properties of mercury compounds.

In addition to choice of compound based upon known natural toxicity prior to entry into the body and natural alteration when in the body, consideration should also be given to possible alteration of toxicity by artificial means. Mercury chloride, for example, if injected intramuscularly may produce much pain, but if mixed with sodium iodide is less painful. This is due to formation of a biniodide which is less ionizable and, therefore, less toxic. On the other hand, iodides may increase toxicity. Mercuric iodide, for example, is quite insoluble, but when mixed with potassium iodide forms a compound potassium mercuric iodide which is quite soluble and may be employed as a germicide in practically the same concentration as mercuric chloride. Sollmann[8] warns against the application of insoluble and apparently harmless mercury compounds to the eyes, when patients are also receiving iodides; the very irritant mercuric iodide may be formed on the conjunctivæ and cause severe injury. Bromides have the same effect. Another example of altered toxicity is met with in the combined use of calomel and iodides or bromides; the latter increase the solubility of calomel.

Aside from the above factors which may influence toxicity, there is, in common with all other poisons, idiosyncrasy. Relationship between dosage and effect is often difficult to determine. Owing to early vomiting in acute poisoning, when mercuric chloride is taken by mouth, it is often difficult to determine exactly

the amount of poison retained in the body. The interpretation of data is further complicated by the fact that commercial mercuric chloride tablets are, as a rule, not pure; they often contain 50 per cent or more of sodium chloride. Not only is the amount of mercuric chloride actually retained in the body, therefore, often less than suspected, but the sodium chloride tends to act as an antidote; it tends to cause formation of a double salt of mercury which is less readily dissociated and, therefore, less toxic. Three grains have, however, been definitely known to have caused death, both in an adult[12] and a child.[12]

The signs, symptoms, pathology and treatment of acute, sub-acute, and chronic mercurial poisoning are too well known to describe in detail, but it may here be observed that any or all of the known signs and symptoms and pathological lesions may be met with regardless of the type of mercury employed and mode of entry into the body.

Delayed Poisoning

A fact of practical clinical importance and, in the opinion of the writer, not sufficiently stressed in text-books, is the misleading character, at times, of the signs and symptoms. This applies particularly to acute poisoning with mercuric chloride. Pain and vomiting may occur within a few minutes, followed some hours later by albuminuria and hæmaturia. All of these signs may then entirely disappear and for a few days the patient is apparently well and on the way to recovery. Five or six days later, albuminuria and hæmaturia may then reappear, followed by progressive kidney damage ending in uræmia and death. For this reason, it is the routine in this hospital never to discharge patients suffering from acute mercurial poisoning in less than two weeks. During this period, in addition to the ordinary chemical tests, blood urea estimations are made daily. Occasionally, the blood urea may increase, thus affording evidence of kidney damage before the reappearance of albuminuria and hæmaturia.

The Significance and Detection of Mercury in Body Materials

Mercury differs from lead in an important respect, from a clinical point of view. Under ordinary conditions there are many sources of lead (food, etc.). Lead is, therefore, commonly found in the urine of normal individuals. The differences between health and disease are quantitative and not qualitative. This does not ordinarily apply to mercury; mercury when found in human excreta, unless due to medication, is usually due to poisoning. The finding of mercury in urine, fæces, vomitus, etc., is, therefore, of diagnostic value.

Details of the different procedures for the detection and quantitative estimation of minute amounts of mercury may be found in standard works on chemistry and will not be repeated here. Suffice it to say that there are many methods, and from those available the qualitative method used in this hospital during the last 14 years is one of the "amalgamation" procedures. The organic combination in which the mercury exists in vomitus, fæces, urine, blood, etc., is broken down by nascent chlorine and by electrolytic double decomposition it is deposited upon copper wire from which it is volatized on to gold foil. The amalgam so formed is readily recognizable by the silvery discoloration of the gold. It is very sensitive; as little as 0.01 mg. of mercury may be detected readily in a large amount of material. Because of this sensitivity, in the interpretation of data it is important to exclude mercurial medication (calomel, etc.).

In spite of the many attempts to estimate extremely minute amounts of mercury quantitatively, very few of the procedures are satisfactory for clinical purposes. This is largely due to the fact that the human materials usually examined, blood, urine, vomitus, fæces, etc., contain organic complex structures. Digestion of the material is, therefore, necessary as a preliminary step, in order to break down the mercury complexes to a simple form. The usual methods of digestion, unfortunately, tend to cause reduction of the mercury and part of these reduced compounds may be lost by volatilization. In the opinion of the writer, the best quantitative procedure now available is the electrolytic method.[16]

Summary

The purpose of this outline is to emphasize the fact that no mercurial compound, inorganic or organic, is harmless; all can be toxic, and their value in therapeutics appears to depend largely upon their conversion from potentially into actively toxic products.

Many factors influence toxicity. By appropriate means, toxicity may be increased or reduced, both before administration and after the mercurial compound has entered the body, and, aside from controllable agencies, the body itself is capable of increasing or decreasing toxicity. Intelligent use of mercurial compounds depends upon the appreciation of these factors.

Attention is drawn to the necessity of more effective legislation for the sale of mercuric chloride tablets.

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CARCINOMA OF THE STOMACH*

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CANCER of the stomach occurs more commonly than is generally realized. The hopeless attitude of many physicians and most patients regarding the possibility of cure is the greatest deterrent to an attempt at early diagnosis. Carcinoma of the stomach can only be cured by means of a radical surgical operation. The observations presented in this discussion are based on an analysis and study of 134 cases of carcinoma of the stomach upon which I have operated.

The first question which naturally confronts one is—what is the incidence of gastric carcinoma in a group of patients who consult the family physician complaining of a gastrointestinal disability? Dwyer, Blackford and Turner,[1] in an analysis of the histories of 3,000 consecutive patients presenting themselves with gastrointestinal symptoms, found that only 15 per cent of such persons suffered from an organic lesion in the stomach or duodenum: 8.1 per cent of the group had duodenal ulcer; 1.6 per cent had gastric ulcer; and 3.6 per cent had gastric carcinoma. Thus one must carry out a careful and exhaustive investigation of patients suffering from so-called "stomach trouble", and find in the end no organic lesion in 85 per cent. Only 3 per cent of this group will suffer from a gastric carcinoma. The final diagnosis of an inorganic disturbance occurring with such infrequency may lead a careless or less indefatigable observer to relax his vigilance. This of course will be disastrous to the 3 per cent of his patients who suffer from gastric carcinoma. Yet, if we look at it in another way, 20 per cent of all the organic lesions occurring in the stomach or duodenum are represented by gastric carcinoma. In other words, one in five of the patients who present themselves complaining of indigestion and suffering from an organic lesion has a carcinoma of the stomach.

TABLE I

Admissions for chronic Gastrointestinal Disease to the Toronto General Hospital, July 1, 1926 to December 31, 1931

Total number	1724	
Gastric carcinoma	227	13.1 per cent
Ratio of upper Gastrointestinal Lesions		
Chronic gall-bladder disease	580	Ratio 2.6
" duodenal ulcer	667	" 3.0
" gastric ulcer	179	" 0.75
Carcinoma of the stomach	227	" 1.0

TABLE II

Personal Cases of chronic Gastrointestinal Disease requiring Operation

Total number	1869	
Gastric carcinoma	162	9.0 per cent
Chronic gall-bladder disease	716	Ratio 7
" duodenal ulcer	425	" 4
" gastric ulcer	104	" 1.0
Carcinoma of the stomach	162	" 1.5

The personal series includes only the cases which have come to operation, and excludes examples of all diseases in which it was felt inadvisable to consider a laparotomy. The

* A lecture delivered during a tour of Western Canada under the auspices of The Canadian Medical Association.

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greatest deception is in the incidence of gastric carcinoma, because it will be shown that in only 50 per cent of the cases of gastric carcinoma which are seen in consultation is it deemed advisable to suggest a laparotomy.

From these considerations, it will be seen that the incidence of gastric carcinoma in the patients of any general practitioner is essentially small. This fact should be no excuse for relaxing vigilance in an attempt to diagnose gastric carcinoma at a time when surgical excision may be done with the expectation of cure. It is gratifying in this respect to note that, dividing this series into two periods, prior to January, 1927, and subsequent to January, 1927, the number of cases operable for cure in the former period was 5.2 per cent and in the latter 10.3 per cent. This was due solely to the careful consideration given by the family practitioner to all patients complaining of stomach trouble.

How important is this disease in the economic life of a country? The following statistics quoted by Hurst[2] present startling revelations as to the incidence of this disease in Great Britain. There are 1,600 deaths annually in Great Britain from carcinoma of the stomach. Five per cent of all deaths occurring after 40 years of age are due to carcinoma of the stomach. The Bureau of Vital Statistics in Washington shows that in the years 1920 to 1929 inclusive, 217,235 people died of gastric carcinoma. The yearly death rate from gastric carcinoma in the United States ranges from 17,625 to 24,843. In Ontario, in the years 1921 to 1930 inclusive, 10,410 people died of carcinoma of the stomach. This disease in Ontario has steadily risen from 960 deaths in 1921 to 1,200 deaths in 1930, giving a rate from 29.3 to 36.2 per 100,000 of population, which compares unfavourably with the rate of 20.1 to 22.2 per 100,000 in the United States. This means that one in three of all the cancer deaths occurring in Ontario are the result of carcinoma of the stomach. Surely then we are not confining our thoughts and energies to an unimportant disease.

It has been repeatedly stated by many authors, and we heartily concur, that the elaboration of exhaustive diagnostic aids, the development of a high perfection of technical skill, with great care in the pre- and post-operative management of these cases, has not materially changed the mortality from carcinoma of the stomach. Why is this? In a former communication[3] I analyzed a series of cases and found that 50 per cent of all the cases of gastric carcinoma presenting at the hospital were so advanced that no surgical procedure was deemed advisable. The residual 50 per cent, or 25 per cent of the whole group, had a lesion which permitted a palliative procedure, and only 5 per cent presented lesions where one could anticipate that resection would be followed by cure. In an analysis of this latter series we have found that the percentage of cases of possible cure has increased from 5 to 10 per cent, but the number of cases presenting in which nothing can be done is still approximately 50 per cent of the total. The following shows the result of a change in the management of these cases, which we adopted in January, 1927:

TABLE III

	Prior to January, 1927 Percentage	*Subsequent to January, 1927 Percentage*
Laparotomy with no operative procedure	25	12
Palliative gastro-enterostomy	30	20
Resections	43	57
Operation for cure	5.2	10.3

Thus we see that by heroic procedures, from a technical standpoint, we have made an advance in reducing the morbidity and increasing the length of life, yet from the standpoint of ultimate mortality from the disease, our improvement has been disappointing. A patient with a gastric carcinoma which is not removed faces an inevitable fatality. Thus we must ask the patient with an advanced lesion to accept the greater operative risk accompanying a resection, in order that he may have the only possible chance of ultimate cure, or, failing a cure, a markedly decreased morbidity, and increased lease of life, and an easier passing. Indeed we have been surprised and delighted with the prolongation of life following resection of what appeared to be almost hopeless mid-gastric carcinoma, the patients having as many as three to four and a half years of perfect health and economic usefulness. By adopting this attitude towards palliative resection in advanced cases, it may be noted that the incidence of gastroenterostomy has dropped one-third, from 30 to 20 per cent, in the two groups. One reason for this is that a gastroenterostomy in the absence of an organic obstruction is of no avail, and, secondly, in the group in which it has been done in the presence of obstruction, when the tumour

could not be removed, with this bold attitude towards palliative resection the average duration of life was only four and a half months, and the period of comfort only a little longer than six or eight weeks. Hence it is a very questionably justifiable procedure.

There is just one pitfall in withholding gastroenterostomy for obstructing, advanced carcinoma of the stomach. Inflammatory lesions can so closely simulate carcinoma as to be indistinguishable without microscopic examination. One patient in this series on whom a supposedly palliative gastroenterostomy was done in 1924 for a hopeless carcinoma is still alive and well. So certain were we of the diagnosis that microscopic confirmation of carcinoma was not obtained, but this obviously was an inflammatory lesion due to an ulcer. Therefore we must have microscopic confirmation of malignancy before taking away all hope from the patient.

What further may we do to bring these cases to the operating room at an earlier stage in the disease? This advance must at the moment lie in an earlier diagnosis. How may this be accomplished? The answer appears to be not in the formulation of a symptomatology for gastric cancer, but rather in constantly suspecting that a patient may suffer cancer of the stomach. The symptoms of gastric carcinoma are so dependent upon the anatomical location and the variation of the gross pathological lesion that a symptomatology of any real value cannot be formulated. Thus we must ask you to accept the idea that *a patient forty years of age or over, who for the first time in his life suffers an indigestion, be suspected of harbouring a gastric carcinoma until it is disproved.* We can quite readily sympathize with the family practitioner who, fatigued by arduous labours, is at an inconvenient time consulted by a patient complaining of vague indigestion. The natural reaction is to recall that only 15 per cent of these people have an organic lesion in the stomach or duodenum, and only approximately 3 per cent have gastric carcinoma, and that the casual questioning without a physical examination, and the dispensing of a routine stomachic will be all that is necessary in 85 per cent of all cases, and will probably avoid disaster in 97 per cent of all cases; yet we must not fail in our duty to the 3 per cent who suffer gastric carcinoma. If the time is not opportune to elicit the history of this indigestion and do a physical examination, at least ask two questions: (1) Is this patient forty years of age or over? (2) Is this the first time that he has ever suffered from indigestion? If the answer to these two questions be in the affirmative, do not put him off with a casual prescription, but ask him to return at a time when you can carefully investigate his problem, and harbour the suspicion that he may be one of the 3 per cent of patients complaining of stomach trouble who suffers cancer of the stomach. If on this second examination you confirm the fact that the indigestion started first after forty years of age, and that it has been continuous, it must not be considered lightly.

What does this entail? Further investigation must be done. A simple and most valuable procedure is the withdrawal of the gastric contents, and the determination of the presence or absence of free hydrochloric acid. Fractional gastric analysis, while yielding more information, is not nearly so important as the determining of the presence or absence of free hydrochloric acid in the stomach contents. The significance of the presence of free hydrochloric acid is emphasized by Hurst and Stewart[4] who state that a person in perfect health who comes for routine examination and shows a normal curve of the free hydrochloric acid on gastric analysis can be assured that for at least five years he will not develop cancer of the stomach. The presence of free hydrochloric acid is compatible with a gastric carcinoma, but it is a very uncommon accompaniment. If free hydrochloric acid is present you are justified in treating the patient by dietetic, medicinal and hygienic management. If improvement does not occur in two to three weeks, x-ray studies are imperative. If no free hydrochloric acid is present in the gastric contents, what should be our attitude? What other organic disease may be responsible for such a finding? Three factors must be considered—first, from 5 to 8 per cent of all persons in perfect health have no free hydrochloric acid; secondly, pernicious anæmia will give this finding; thirdly, a percentage of cases suffering from chronic calculous cholecystitis have no free hydrochloric acid. Thus a patient suffering indigestion with no free hydrochloric acid must have first a complete blood analysis to exclude pernicious anæmia. If this shows a normal blood picture, x-ray studies must be carried out, including cholecystography to determine gall bladder function. Supposing that the x-ray findings

show no organic lesion in the stomach or gall bladder, and the blood examination excludes pernicious anæmia, what is our next procedure? This is based on the fact that the value of an x-ray study of the gastrointestinal tract is assessed in accordance with the efficiency of the radiologist, rather than determined by the efficiency of the physical equipment. X-ray studies by the most expert radiologist are not infallible. The location of the lesion may render it impossible of visualization by this method of study, so that a negative x-ray, while it is a comfort, is not proof positive that the patient is not suffering from carcinoma of the stomach.

Thus we are forced to base our opinion regarding the proper procedure solely on analysis of the clinical history. While, as stated, it is impossible to detail a symptomatology characteristic of the various manifestations of carcinoma of the stomach, it can safely be said that a patient forty years of age or over, who for the first time in his life suffers continuous indigestion characterized by lack of appetite, an absence of free hydrochloric acid in the gastric contents, a negative result from x-ray studies, and a normal blood picture, is entitled to and should be advised to submit to a laparotomy in order to exclude carcinoma of the stomach. By this procedure we may subject a few patients to a laparotomy and find no organic lesion in the gastrointestinal tract to explain their symptoms; yet I would personally want this management were I confronted with the decision. The risk of the laparotomy is negligible as compared with the risk of waiting until irrefutable evidence of gastric carcinoma is present. This was illustrated by three cases seen in the last five months. The above hypothesis confronted us, and operation was overruled in each case solely on the fact that x-ray studies failed to reveal the carcinoma. Two, three and five months later these patients showed positive radiological evidence of carcinoma, and were submitted to operation. It is impossible to say that earlier operation would have saved their lives, but at least they would have been given a better chance for cure.

A further problem may confront us following the radiological investigation of these cases. Suppose the diagnosis be gastric ulcer, what should be our attitude? We do not share the belief of the group of surgeons who ask that all patients suffering from gastric ulcer be at once submitted to an operation. This attitude is based on the supposed relationship between gastric ulcer and gastric cancer. There is no desire on my part to enter into a discussion of the incidence of gastric cancer developing on gastric ulcer. What is our great concern, however, is the important decision—is the ulcer malignant now? All surgeons have been humiliated by their inability, even with the abdomen open and the opportunity to palpate the ulcer, to state definitely whether they are dealing with a benign or malignant gastric ulcer. In the Toronto General Hospital Dr. Wookey, some years ago, re-examined the museum specimens labelled "Benign gastric ulcer". Eighteen per cent of these specimens on further histological study showed evidence of malignancy. Finsterer admits from 17 to 22 per cent of error in various series in making the diagnosis of a benign gastric lesion, when on histological examination malignancy is proven. This error by a surgeon having such a vast experience with cases carefully studied pre-operatively, and with the opportunity to palpate the lesion through the open abdomen, makes one pause and give it real consideration.

How then may we assess the facts and determine if we are confronted with a benign or malignant ulcer? The site of the ulcer is important in this decision. In our series we have been impressed with the rarity of benign ulceration in the pylorus. The accompanying Table shows the incidence of ulcer and carcinoma in the pyloric and mid-gastric regions.

TABLE IV

	Benign ulcer Percentage	*Cancer Percentage*
Pyloric region	5.8	60
Mid-gastric region	94.2	40
(35 per cent with associated hour-glass)		

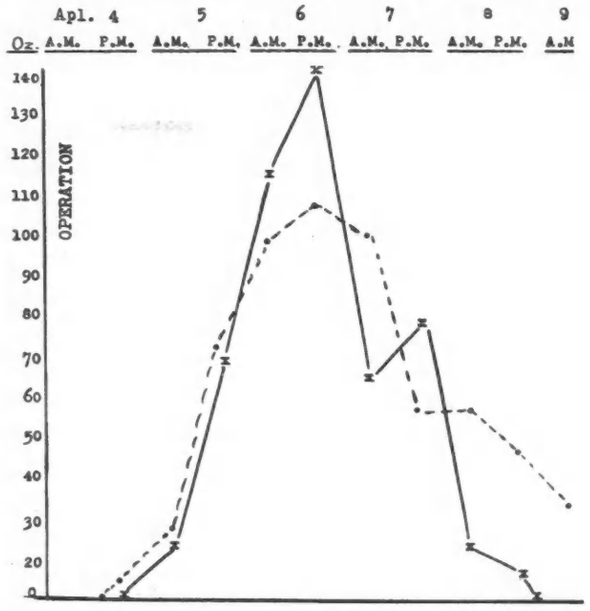
Hurst and Stewart (*loc. cit.*) report 3, or 33 per cent, of 9 pyloric ulcers as malignant, while only 8, or 4.6 per cent, of 172 ulcers on the lesser curvature were malignant. This is further emphasized in an entirely different group of patients reported by Haudick from Von Eiselberg's Clinic in Vienna. He reports that 33 per cent of pyloric ulcers are malignant, while only 3 per cent of the ulcers in the pars media are malignant. This is not at great variance with our experience. We cannot demonstrate a single case in which a pyloric gastric ulcer definitely produced organic stenosis. We believe that the group of pyloric ulcers reported

by British surgeons are in reality duodenal ulcers. Thirty-five per cent of the lesser curvature ulcers which we have encountered show an organic hour-glass constriction. This leads to the conclusion that ulceration in the pars media may remain benign for a very long time, and such ulceration is a relatively slight potential menace, as it rarely develops into gastric carcinoma.

Our method of selection of patients requiring operation, which has proven satisfactory and avoided many unnecessary operations for gastric ulcer, is as follows. The patient is given bed rest and a duodenal tube is passed until by x-ray examination its presence in the duodenum is confirmed. The patient is nourished through this tube for three weeks. At the end of this time further x-ray studies are made, and the size of the defect compared with the original film. In a surprising percentage of cases x-ray evidence of complete healing is presented. If the ulcer is smaller, and healing apparently progressing, a further period of three weeks' treatment is carried out. If at the end of this time healing has not occurred, a laparotomy is advised, as we are not justified in concluding that the ulcer is benign. On the other hand, if there is radiographic evidence of complete healing, we have no justification to completely reassure the patient. We have seen the complete disappearance of radiographic evidence of ulcer in instances where recurrence of the ulcer in a few weeks was proven to be malignant. When such healing takes place, the patient is re-examined radiologically in six weeks. If any evidence of recurring ulceration is present, immediate operation is advised. If no recurring ulceration takes place, x-ray studies are repeated in three months, then six months later, and again at the end of another six months. If healing is maintained over this period of observation, one can be reasonably sure that the ulcer is benign. The patient is warned to return for further investigation if there is the slightest recurrence of gastrointestinal symptoms.

If operation is accepted by the patient, what hazards must he or she accept, apart from a growth too extensive to permit of any relief? Our deaths have been due to five main causes—shock, peritonitis, respiratory complications, cardio-vascular accidents, and imperfect healing. In dividing our mortality into the groups prior to January, 1927, and since January, 1927, we find that it has been constant at 17 per cent, despite the fact that we have increased the incidence of gastric resection from 43 to 57 per cent. There have been no deaths from shock since January, 1927. Chest complications have accounted for only one death in all our operative procedures in 1931, and no death in 1932. We believe this is due to the type of anæsthesia which we are using, gas and oxygen, field block, splanchnic anæsthesia through the open abdomen, or spinal anæsthesia in various combinations, together with the fact that all patients on their return to bed are stimulated to overbreathing by the administration of carbon dioxide gas every hour for the first twelve hours, and every two to four hours for the next thirty-six hours; this in the belief that post-operative pulmonary complications are primarily represented by varying degrees of atelectasis due to the splinting of the upper abdomen and to the paralysis of the lower intercostal accompanying spinal anæsthesia used for upper abdominal operations. Vascular accidents include emboli, cerebral hæmorrhage and previous myocardial disease. Peritonitis ranks on a par with cardio-vascular accidents as an operative hazard. In 23 operative deaths 5 deaths were due to peritonitis, 2 since January, 1927, out of a total of 10 deaths, and therefore it is felt that we can reduce the hazard of operation by very markedly decreasing chest complications, shock and peritonitis—chest complications, by the anæsthesia and the post-operative breathing of carbon dioxide; shock by the generous use of blood and other intravenous fluids; and peritonitis, by refinement of the operative technique, and the careful preparation of the patient. Where it is necessary to deal with a stenosing pyloric carcinoma, with the inevitable gastric retention and accompanying œdema of the gastric wall, repeated gastric lavage and a fluid diet for a week or longer will permit marked decrease in the œdema of the gastric wall. The presence of this severe degree of œdema we believe was responsible for peritonitis in two cases. We have also found that, despite a widely-open stoma, in the first few days following operation there is an accumulation of content in the stomach, and we now pass a duodenal tube as a routine, twenty-four hours after operation. The discrepancy in the volume of fluids which is drawn off from patients who have had as nearly as possible identical procedures is difficult to explain, but that the stom-

ach should be kept empty is very important, in order to avoid undue strain on the suture line. Occasionally one will have an outpouring of an incredible volume of fluid from the stomach, and intravenous saline must be introduced to balance this fluid loss. The accompanying Chart shows



Key: ——— indicates output per os in ounces for 12-hour periods.
- - - - - - - - indicates intake per os in ounces for 12-hour periods.

This Chart graphically represents the discrepancy between intake and output per os; this is controlled by an indwelling duodenal tube, encouraging the patient to drink as much as possible.

Mr. F.H., gastric resection for stomal ulcer œdema at stoma producing obstruction of three days' duration. Uneventful convalescence after April 8th.

the transient character of this gastric delay, and its sudden relief. Dr. Lewis has carried out a very detailed investigation on this subject, which is being published elsewhere, and has shown that the major factor responsible for this is due to œdema at the site of anastomosis, and the degree of œdema is in direct ratio to the degree of inflammatory change which is found in the resected stomach.

This leaves us with two uncontrollable hazards, first vascular accidents and vascular insufficiency due to accompanying cardiovascular disease, and, secondly, imperfect wound healing. We have had three cases which have eviscerated themselves ten to twelve days after operation, this despite our best technical efforts. Furthermore, in this total mortality which we are reporting of 17 per cent, it must not be forgotten that that is not in a selected group, but in all the cases, including those in which only a simple laparotomy was possible, those in which a palliative gastroenterostomy was done, and also those in which complicated resections, removal of portions of other organs such as the liver, pancreas and colon, coincident with the removal of the gastric carcinoma, was done. Thus the hazard which we ask the patient to take is not too great in view of the seriousness of the disease.

The operative mortality for all operations for gastric carcinoma including simple laparotomy, palliative gastroenterostomy, palliative resection and resections for cure is as follows:—

TABLE V

	No. of Cases	*Deaths*	*Percentage*
Prior to January, 1927	76	13	17
Subsequent to January,1927 ..	58	10	17

The technical factors concerned with the operation are based upon the anatomy of the organ, particularly in reference to its blood supply and the lymphatic drainage. In order that thorough extirpation of the tumour may be made, the whole of the gastro-hepatic omentum, the anterior layer of the gastro-colic down to the transverse colon, the entire lesser curvature of the stomach to the œsophagus and about four-fifths of the stomach should be removed in one mass. We have not practised the entire removal of the great omentum from the transverse colon, as advised by Finsterer, because in a survey of the autopsy and operative material over a period of ten years we have not found this structure the seat of metastases, unless irremovable metastases were present elsewhere, and in no instance has the autopsy material shown independent gross metastases in the great omentum.

CONCLUSIONS

1. Gastric carcinoma is a serious economic disease causing an annual loss of life which is staggering.

2. Three per cent of individuals complaining of stomach trouble suffer from gastric carcinoma. Thirteen point one per cent of all cases entering the Toronto General Hospital for chronic gastrointestinal ills have gastric cancer, and 9 per cent of a similar personal group.

3. Twenty-three point five per cent of all personal operations for organic lesions in the stomach and duodenum are for cancer of the stomach.

4. Thirty per cent of all deaths from cancer in Ontario during the last ten years are due to cancer of the stomach.

5. Without surgical excision of a gastric carcinoma the patient is inevitably doomed.

6. Palliative resection is a justifiable procedure.

7. The decrease in the incidence of the number of deaths from carcinoma of the stomach can only be accomplished by earlier diagnosis.

8. All patients, 40 years of age and over, who come complaining of indigestion occurring for the first time in their life must be suspected to be suffering from carcinoma of the stomach.

9. Such patients are entitled to a thorough investigation by means of analysis of the history and physical examination, together with the determination of the presence or absence of free hydrochloric acid in the gastric contents.

10. If hydrochloric acid is absent from the gastric contents in such a patient, and pernicious anæmia and gall-bladder disease can be excluded, he should be sent for radiological studies.

11. A negative radiological finding in such a patient who shows an absence of hydrochloric acid is no justification for assuring the patient that he has not carcinoma of the stomach, and he should be advised to have a laparotomy.

12. A method of management is suggested for selecting patients suffering from gastric ulcers, who should be advised to have a laparotomy.

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STERILITY IN THE FEMALE

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STERILITY is probably the most interesting subject in the whole field of gynæcology. It may be defined as the inability on the part of the female to produce a living child. Sterility is not a disease, but a symptomatic result of one or more pathological defects, not limited to the reproductive organs but including nearly every metabolic process in our complex physiology. It is not an absolute quality, but rather a graded abnormality, with normal fertility at one end and clinical sterility at the other. To successfully treat such a complex problem one must have the utmost cooperation of the patient, and also personally exercise the greatest patience, with the most critical evaluation of the minutest details in history, clinical signs and symptoms. No case can be lightly condemned as hopeless or again another accepted as a simple problem easy of solution.

BASIC FACTORS IN FERTILITY

In order to discuss sterility adequately, certain essential factors must be determined as a basis of normal fertility. These have been listed by Aldridge[1] as follows: (1) the production of normal spermatozoa capable of being deposited undamaged in the vagina; (2) a vaginal and cervical secretion favourable to the life of the spermatozoa; (3) the cervix, uterus and tubes must allow the upward migration of the male germinal cell and the free descent of the ovum; (4) the production of normal healthy ova; (5) an endometrium capable of sustaining the fertilized ovum to maturity. A break anywhere in this chain results in the complete collapse of the whole process of fecundation.

ETIOLOGICAL FACTORS IN STERILITY

These are as many and varied as the signs and symptoms met with in our consulting rooms, but may be grouped under several broad headings as follows.

1. *Defective production of spermatozoa.*—This may result from underdevelopment, non-descent or atrophy of the testicle, as a result of disease, alcoholism, drug addiction or thermal agents. Moench[2] states that normal semen is alkaline in reaction, contains from 100 to 150 million spermatozoa per cubic centimetre, and he grades the normal cell by the morphology of the head. He claims that less than 15 per cent of abnormalities occur in normal semen; 19-20 per cent of abnormal semens are usually potent; 20-23 per cent manifest impaired potency, and that the presence of 25 per cent abnormal heads may be regarded as indicating impotency. The

TABLE I.

CAUSES OF STERILITY IN 182 CASES

1. Defective production of spermatozoa (only 46 cases examined)	14
2. Obstruction of male passages (no record worth including).	
3. Faulty delivery and reception—	
(*a*) Spasm of vagina	9
(*b*) Premature ejaculation	2
(*c*) Hypospadias	0
(*d*) Retroverted uterus	47
(*e*) Hypertrophic conical cervix	9
(*f*) Unruptured hymen	3
(*g*) Infantile vagina	17
4. Cervical Conditions—	
(*a*) Acidity of cervical secretion	11
(*b*) Cervical infection	101
(*c*) Simple mucous plug	37
(*d*) Cervical fibroid	2
5. Uterine Conditions—	
(*a*) Infantile state	34
(*b*) Uterine fibroids	3
(*c*) Endometrial hyperplasia	2
6. Tubal Occlusion	53
7. Defective Ovulation—	
(*a*) Developmental	4
(*b*) Mechanical	11
8. Endocrinal—	
(*a*) Ovarian	16
(*b*) Pituitary	17
(*c*) Thyroid	39
9. General Metabolic Disorders—	
(*a*) Adiposity	21
(*b*) Malnutrition	11
(*c*) Anæmia	17
10. Congenital Defects	1
11. Non-retention of fertilized ovum (not included)	=470 defects.
(5 cases—no apparent reason for sterility).	

popular conception of motility as an indication of fertility has been largely discredited.

2. *Obstruction of the male passages.*—This is nearly always the result of gonorrhœal infection. Polak[3] states that 10-15 per cent of marriages are barren; 50 per cent of sterile unions are due to gonorrhœa; and 90 per cent of barren women are married to men who have had a Neisserian infection. The faith of the average man in his own procreative ability and his willingness to place the blame of an unproductive union on his wife are remarkable. I have been able to obtain semen specimens in only about 20 per cent of my cases.

3. *Faulty delivery and reception.*—This results from premature ejaculation and hypospadias in the male; in the female, from vaginismus, an intact hymen, a faulty seminal pool or post-cervical recess, as seen in the infantile vagina; a long conical cervix or a retroverted uterus may also carry the cervical os beyond the receptive situation.

4. *Endocervical conditions.*—Here we find the most common cause of sterility. Such conditions as infection, the barrier of a tenacious mucous plug, acidity of the cervical secretion, and occlusion from fibroids and polypi may be looked for.

TABLE II.

RESULTS ACCORDING TO DEFECTS

Defect	*Number*	*Number Treated*	*No Result*	*+Result Only Treatment*	*+Result Concurrent Treatment*
Defective spermatozoa	14	3	2	0	1
Vaginal spasm	9	8	6	1	1
Retroverted uterus	47	38	15	4	19
Hypertrophic cervix	9	7	5		2
Cervical fibroid	2	2	1		1
Intact hymen	3	3	1	1	1
Infantile vagina	17	15	12		3 (1 term, 2 aborted)
Acid cervical secretion	11	11	4	1	6
Cervical infection	101	101	57	17	27
Cervical mucus	37	37	10	8	19
Congenital defects	1	0			
Infantile uterus	34	27	19	3	5 (3 term, 5 aborted)
Uterine fibroids	3	3	1	2	(1 term, 1 aborted)
Endometrial hyperplasia	2	2	1	1	
Tubal occlusion	53	51	19	4	28
Ovary, developmental	4	4	4		
Ovary, mechanical	11	11	10		
Ovary, endocrine	16	14	9	1	4
Thyroid, endocrine	39	21	9	3	9
Pituitary, endocrine	17	14	8		6
Overweight	21	19	10		9
Malnutrition	11	1	7		3
Anæmia	17	17	10	2	5

TABLE III.

RESULTS OF SPECIFIC TREATMENTS

Lesion	*Method of Treatment*	*Number*	*+Result*	*−Result*	*Percentage+*
Cervical infection	Local applications	35	11	24	31.4
	Cautery	54	29	25	53.4
	Operative repair	12	4	8	33.3
	Cervical dilatation	6	1	5	16.6
Salpingitis	Freeing adhesions, etc.	23	9	14	39.1
	Salpingostomy	10	2	8	20.0
Retroverted uterus	Pessary adjustment	34	7	27	20.6
	Uterine suspension	32	16	16	50.0
Glandular dystrophy	Therapy	53	15 (8 thyroid)	38	28.3
Tubal occlusion	Tubal inflation	51			
	Occluded	15			
	Patent at inflation	8	1	7	12.5
	Opened	28	23	5	82.14
Exophthalmic goitre	Thyroidectomy	3	2	1	66.6

5. *Uterine conditions.*—More academic than actual, but definitely including fibroid tumours, endometrial hyperplasia and under-development.

6. *Tubal occlusion.*—The second offender in order of merit, and usually a sequence of gonorrhœal, post-abortal or post-partum infection.

7. *Defective ovulation.*—This may result from endocrinal under-development, mechanical obstruction from adhesions or inflammation, and cystic degeneration of the ovary.

8. *Endocrine dystrophies.*—Here the thyroid gland is more often at fault, but the ovary and pituitary glands are important factors.

TABLE IV.

Number of cases, 182—Result +81 = 44.5 per cent.		
Number of pregnancies resulting	131	
Number of term deliveries	95	
Number of abortions	23	
Number of ectopic gestation	4	
Number now pregnant	7	
Number pregnant—no record	2	
Average period of sterility	4.3	years
Longest " " "	20	"
(+result with 3rd husband—aborted)		
Average age of patients	25.4	"

9. *Faulty metabolism.*—This affects both the male and female. It demands a consideration of such things as weight, diet (especially proteins, vitamines, and mineral salts), blood dyscrasies, illnesses during adolescence and puberty, skeletal framework, sexual excesses, libido, overwork, exercise, chronic infection, and intoxications, etc. So delicate is the metabolism of the sex cells that any state of constitutional depression must promptly reflect itself in them.

10. *Congenital defects* usually result in absolute sterility.

11. *Non-retention of the fertilized ovum.*

The accompanying Tables give an analysis of 182 cases from my private practice in which sterility was given as the primary complaint. No cases are included with the so-called "chronic pelvis". Their complaints and hopes have advanced far beyond the question of reproduction.

The number of semen examinations is very inadequate but this was unavoidable. No patients were subjected to operative interference primarily for sterility unless the male was proved innocent of blame. A list of 470 lesions indicates the difficulty of defining a specific cause in any case. The endocrine dystrophies were mostly mixed in type, but an attempt was made to determine the gland most at fault in each case. Non-retention of the fertilized ovum is worthy of a separate consideration.

TABLE V.

CASES REFUSED TREATMENT

Defective spermatozoa of husband	14
Cardiac disease	2
Tuberculosis	2
Diabetes (now pregnant)	1
Mental defect	1
Marked endocrine disturbance	7
Syphilis	1

TABLE VI.

RELATION OF MENSTRUAL PAIN TO RESULTS OBTAINED

Pain	*No.*	*+*	*—*	*Percentage*
None	46	25	21	54.26
Pre-menstrual	110	43	67	39
Inter-menstrual	49	10	37	24.5
Post-menstrual	10	1	9	10

The results in Tables II and III are probably misleading, because in a large percentage of cases one or more methods of treatment were

in progress concurrently. This especially applies to the operative results where two or three distinct procedures were completed. Also the actual curative factor was hard to determine, and a single positive result therefore often shows after two or more corrected lesions or treatments. The effect of retroversion of the uterus or its correction was in this way nearly always an associate, and I do not believe either has much bearing on sterility. Simple dilatation of the cervix was performed only six times. I consider the so-called "pin-hole os", acting as a barrier to the ascent of spermatozoa, is a fallacy; it is usually associated with infantilism and its dilatation is a useless procedure. The

TABLE VII.

CAUSES OF TUBAL OCCLUSION (53 CASES)

Infantilism	2
Post-operative adhesions	2
Ruptured appendix	4
Intestinal tuberculosis	1
Post-gonorrhœal infection	21
Post-abortal infection	12
Post-partum infection	6
No apparent cause	5

TABLE VIII.

OTHER POSSIBLE ETIOLOGICAL FACTORS

Masculine type—11 cases.			
Not treated	1		
Became pregnant	4	40	Per cent
History of previous abortions—34.			
Became pregnant	11	32.4	"
History of previous labour—23.			
Became pregnant	15	65.2	"
History indicating maternal gonorrhœa—61.			
Became pregnant	19	31.14	"
Frigidity as a symptom—33.			
Became pregnant	22	66.6	"
Definite overwork in early life			34
Definite defective diet			11

performance of salpingostomy on the proximal end of a Fallopian tube is useless, and at the fimbrial end the lumen is usually occluded by adhesions before conception can occur. Minor degrees of ovarian cystic degeneration was noted in 31 cases. Its occurrence or correction apparently was not a factor of much importance in reproduction. Glandular therapy has so far been disappointing. Of the older preparations, thyroid extract alone has any dependable effect. The newer preparations of pituitary and placental extracts have yet to be evaluated and standardized as to efficiency. Also economical conditions during the past few years have so limited their clinical application that no comment, other than one of uncertainty and doubt, can be given. The results of tubal inflation, where an obstruction was definitely overcome, are striking, and place this procedure in the foreground as a method of treatment in properly selected cases. However, tubal inflation has definite indications and contraindications, and was advised only when other very evident lesions had been corrected. It is not used as a routine early method of treatment in all cases of sterility. The following interesting findings were elicited from the present analysis.

Evidently the time of pain at menstruation has a very direct bearing on your hope of success in treating such cases.

SUMMARY

1. Sterility is not necessarily a local problem of the female reproductive system, but may have its cause in far-removed organs or systems. The first, or most evident, pathological lesion discovered is not always the cause.

2. The male member of the marital union must not be overlooked.

3. Infection and endocrine dystrophies constitute the causative factor in the vast majority of cases.

4. Operative measures are only necessary in about 20 per cent of cases.

5. There is no place for popular or pet fads in treatment, but the condition demands a thorough investigation, both physically and socially.

6. The results of tubal inflation in properly selected cases has not been fully appreciated.

7. The results obtained amply compensate for the hours of tedious investigation and disappointments met with in such cases.

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THE TREATMENT OF SYPHILIS IN THE PRESENCE OF PULMONARY TUBERCULOSIS*

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THE objective of the study on which this paper is based was a definite plan of treatment for those patients with syphilis who also have pulmonary tuberculosis. Patients who have the combined diseases are often referred to chest clinics and sanatoria. Thus the problem of what to do for these people concerns sanatoria and chest clinics, and also the private physicians who have sent them.

The fact that we made the question of treatment a definite problem has a logical explanation. We began our work with the false assumption that probably we could easily find some agreed-upon policy regarding treatment. Investigating this point, we discovered in discussions on this subject with many people that there was a great difference of opinion regarding the therapeutics. Thus arsenic, for example, was definitely considered by some to be contraindicated in the presence of pulmonary tuberculosis. In general, the impressions we received might be summarized by saying that many people were definitely opposed to active treatment, and there were individual prejudices against the use of one or more of the anti-luetic specifics. Continuing our investigations, we found that the differences in practice were just as great as in theory. The problem of treating the tuberculous syphilitic becomes a real issue when we find that sanatoria have as yet not agreed on definite plans of treatment, as they have in regard to collapse-therapy in tuberculosis, for example. We believe that when a sanatorium accepts a tuberculous patient who has an associated disease, like syphilis, there should be some definite plan of treatment and some scheme for deciding which cases are suitable for active treatment of the syphilis.

Statistical studies regarding the treatment of these people are unreliable. In going over histories one may find many cases of tuberculous syphilities treated, but the point we make here is that many of those will be found to have had inadequate treatment. The tuberculous syphilitic should have adequate treatment, or none at all. We grant that the prevailing practice of having the available tuberculous syphilities scattered in widely separated institutions, or in separate buildings within one institution, has been the chief obstacle to a definite attack on the problem. This practice, we believe, has also tended to minimize the good work done by individual physicians on the occasional cases they have studied. In our Medical Infirmary of 100 beds there have been in the past two years always from 7 to 10 cases showing positive blood Wassermann tests. During this period 7 cases of syphilis have been actively treated.

The literature on the subject of syphilis associated with pulmonary tuberculosis presents many markedly differing ideas and viewpoints regarding treatment and the selection of cases for the same. The impression we have obtained is that syphilis exerts an unfavourable effect on the lung lesion. The longer the syphilitic infection antedates the onset of tuberculosis, the less obvious is the degree of harmful effect exerted on the tuberculous process in the lung. Yet even in congenital lues it was felt that pulmonary tuberculosis would tend to run a more unfavourable course.

As regards the selection of cases for treatment, there are references in the literature in which it is advised that the active, progressive, exudative tuberculous case with syphilis be treated actively for lues. The impression one gets of the present-day opinion on this point is that it is inadvisable to treat lues in the presence of actively progressing tuberculosis. Certainly none of our cases were selected for treatment when there was any obvious evidence that the tuberculous lesion was spreading. We believe this a good rule to adopt in view of the present opinions held in many sanatoria.

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None of our treated patients showed demonstrable organic lesions of the cardio-vascular, or central nervous system. Three, however, showed positive findings in the spinal fluid.

The literature in regard to the selection of anti-luetic drugs contains many conflicting opinions. Thus one finds the use of potassium iodide both spoken against and advised. Arsenic is recommended in small or large doses, according to the viewpoint of the writer. The above is not intended to imply a full review of the literature, but to point out the problems one has to solve in attempting to provide one institution with a working plan for the selection and treatment of the tuberculous syphilitic. Tables have been prepared to show the essential data on the cases we treated. Table I is intended as a brief presentation of the problem in each case as it concerns the association of the two diseases.

TABLE I.

Case	*Age*	*Lung involvement*	*The period that luetic infection preceded tuberculosis*
1	26	Moderately advanced	Congenital lues
2	21	Far advanced	9 months
3	33	Far advanced	2½ years
4	32	Far advanced	3 years
5	30	Far advanced	2 years
6	40	Minimal	Co-incident
7	47	Advanced	2 months

The general plan of the treatment given is outlined in Table II.

TABLE II.

Day	*Intravenous*	*Intramuscular*
1	0.2 gm. novarsan	4 grs. bismuth hydrate
8	0.2 gm. "	4 grs. " "
15	0.45 gm. "	4 grs. " "
22	No treatment	
29	0.45 gm. novarsan	4 grs. " "
36	0.45 gm. "	4 grs. " "
43	No treatment	Van Den Bergh
50	0.45 gm. novarsan	4 grs. bismuth hydrate
57	0.45 gm. "	4 grs. " "
64	No treatment	
71	0.45 gm. novarsan	4 grs. " "
78	0.45 gm. "	4 grs. " "
85	0.45 gm. "	4 grs. " "

Rest two months—Van Den Bergh. Give 2-3 courses, depending on whether the patient be classed A, B, or C.

In every case it was found that the luetic infection had preceded the onset of clinical tuberculosis. In the case of No. 7 it is important to point out that he had had tuberculosis for three years previous to acquiring his lues. He however showed exacerbation of symptoms two months after his luetic infection and so was re-admitted to the sanatorium. One should be cautious here in ascribing the exacerbation to syphilis, for many tuberculous patients break down after leaving a sanatorium.

Certain modifications of the treatment indicated in Table II were used on some of the cases. These were as follows. The novarsan treatments were accompanied by intramuscular injections of bismuth and mercury alternately, in doses of grs. 2 and grs. 1, respectively. Another plan was to give a course of 15 weekly injections of novarsan, with alternately bismuth or mercury. The schedule of this course was (1) six injections of novarsan followed by one week of rest, and then (2) three periods of three weeks' treatment, with the usual interval of one week between periods.

Up to date 6 out of 7 patients have each received from half a course, as outlined in Table II, to 3 courses of the same, or the equivalent in the modified forms of treatment, as suggested. In two cases, tryparsamide was given over a period of 37 weeks before beginning the main treatments outlined above. Each tryparsamide (intravenous) injection was given concurrently with one intramuscular injection of either bismuth salicyate, grs. 2, or of mercury salicylate, grs. 1, the bismuth and mercury alternating. The schedule of this course was as follows:— (1) 5 weekly injections of tryparsamide; (2) 6 weekly injections of bismuth alone; (3) rest 1 month; (4) 6 weekly injections of tryparsamide; (5) rest 2 months; (6) 8 weekly injections of tryparsamide. In the Table given below tryparsamide treatments are not included.

TABLE III.

Case	*No. of weekly treatments*	*Date of first treatment*	*Subsequent change in lung*
1	1	Nov. 17, 1932	Patient died of tuberculous pneumonia
2	30	Nov. 2, 1931	Good healing
3	12	July 27, 1933	Slight but definite improvement by x-ray
4	5	Dec. 7, 1933	Moderate improvement
5	15	May 18, 1933	Moderate improvement
6	30	Sept. 1, 1932	No changes in minimal lesion
7	5	Dec. 1, 1933	Moderate improvement

In connection with the above Table there are several explanatory facts that should be given. Cases 4 and 7 had previously to the treatments indicated received 37 weeks of tryparsamide

treatment. In both cases these treatments began on March 21, 1933.

One patient only did not show improvement in the lung condition, but died of tuberculous broncho-pneumonia, which apparently began 5 days after a single injection of novarsan. This patient had received, previous to coming to sanatorium, 6 injections of novarsan, followed by 1 month of potassium iodide. We continued treatment here, to the extent of giving 1 novarsan injection. One might discuss the question of whether it was the giving of potassium iodide that caused the spread of disease. That one injection of novarsan could do this we think it not logical to believe in view of the fact that certain authorities advise arsenic in active pulmonary tuberculosis associated with syphilis. In any case, we have noticed what we believe to be too great a tendency to ascribe the spread of tuberculous disease to various specific factors. We believe this tendency implies a failure to fully recognize that tuberculosis may spread while the patient is confined to bed, and where no causative factor can be found, whether in therapeutics or otherwise. In the 10 months beginning 2 months before the patient under discussion developed a spread of disease, 3 other cases of tuberculous broncho-pneumonia developed amongst 100 infirmary patients.

TABLE IV.

Case	*Serological state at the onset of treatment*	*Present serological state*	
1	Wassermann—4 plus	Wassermann—Neg.	None*
	Kahn —4 plus	Kahn —Neg.	
2	Wassermann—4 plus	Wassermann—Neg.	
	Kahn —4 plus	Kahn —1 plus	None*

* Present positive spinal-fluid findings.

All 7 patients had definite history of exposure to luetic infection, followed by the appearance of a genital sore at the usually accepted time for the appearance of the primary chancre. All had positive blood findings, and 3 had positive findings in the spinal fluid. In two cases, following treatment, positive blood findings were made negative, or nearly so, and these 2 cases are outlined in Table IV. In both cases the tuberculous lesion has done well.

The above cases 1 and 2 were in the former Tables numbered 6 and 2, respectively. It will be noted on consulting the former Tables that both were early cases of lues and both were actively treated. In neither case was the lung lesion adversely affected, and this was also true after periods of 15 months and 25 months, respectively, for cases 1 and 2 in Table IV, after starting treatment. We believe these two cases are important in illustrating the point that where a tuberculous patient recently infected with syphilis is admitted to sanatorium, treatment for the syphilis should be adequate. If the patient be allowed to wait one or two years before instituting such treatment, valuable time will be lost as far as the chances of effecting a cure of the syphilis is concerned.

SUMMARY

During the period from November, 1931, to December, 1933, in a medical infirmary of 100 beds, 7 cases of syphilis associated with pulmonary tuberculosis received active antiluetic treatment. In 6 cases the tuberculous lesion has progressed favourably. In 1 case tuberculous broncho-pneumonia developed. This case has been discussed. The two cases treated with tryparsamide showed no visual disturbances.

The tuberculous patient with early lues should have active and adequate antisyphilitic treatment.

None of the cases treated had obviously active or spreading disease.

We wish to thank Dr. Jaffray, of Hamilton, consultant in Dermatology, for help in this study.

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DINITROPHENOL: ITS THERAPEUTIC AND TOXIC ACTIONS IN CERTAIN TYPES OF PSYCHOBIOLOGICAL UNDERACTIVITY.—J. H. Masserman and H. Goldsmith have studied the pharmacological and psychotherapeutic effects of sodium dinitrophenol in 18 patients whose psychobiological status was characterized by sluggishness, passivity and apathy. In therapeutic dosage the drug caused a mean rise of 32.9 $\pm$ 3.31 per cent in the rate of oxygen consumption and a mean weight loss of 0.92 pound (417 Gm.) per week. Toxic effects occurred in 5 cases and were characterized by a fall in blood pressure, tachycardia, acidosis, progressive stupor and one death. Indeterminate or adverse psychotherapeutic effects were observed in 8 and 4 patients, respectively, while 6 showed a definite improvement in their mental state, apparently attributable to the medication. Dinitrophenol is therefore unpredictably toxic to some patients, but its careful administration may be of empiric benefit in certain types of recent and insecurely established psychobiological underactivity.—*J. Am. M. Ass.*, 1934, **101**: 521.

PROBLEM OF THE SQUINTING CHILD

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ALTHOUGH it is now over thirty years since Worth's epochal work in laying down the principles of the understanding and treatment of squint, it is doubtful whether the average squinting child is as yet receiving the care that it should. At any rate, it is still rather the exception to see cases of squint in which these principles for the preservation or restoration of function of the squinting eye have been adequately applied. Generally speaking, except in cases where the correction of a refractive error abolishes the squint, the main reliance has been placed on surgery with a view chiefly to the cosmetic result. Surgical procedure cannot, of course, be eliminated in most cases of squint, but unless it is applied in conjunction with other measures directed to the preservation or restoration of the visual function of the squinting eye, the results are not satisfactory.

There are several reasons for the apparent neglect in this important field. In the first place, the laity, and possibly also the general profession, are still not sufficiently impressed with the necessity of the earliest possible treatment when a squint develops. The idea that the child may "grow out" of the squint is still prevalent and is relied upon. Secondly, the extravagant claims of non-medical eye practitioners, employing various muscle-training apparatus, has caused the application of even proper orthoptic training to fall into disrepute. Thirdly, since the patients are generally young children, and the training is long and tedious, some oculists are perhaps not inclined to undertake or advise it. For that matter the parents themselves have often to be aroused to the necessity of undertaking treatment. Their interest and enthusiasm must be stimulated in order that they may cooperate in the often long and tedious treatment. Nothing short of the utmost devotion to the subject and the closest cooperation between doctor and parents will yield any worth-while results, if the final goal is the restoration of normal function in the eyes of a squinting child.

The question then arises if the attainment of this goal is worth while? The answer is probably best given by any adult who is or has been a victim of this functional and deforming defect. Without exception he will tell a story of extreme mental suffering from the time when he first realized that he had something that set him apart from other children, to whom he was often an object of ridicule. He was severely handicapped in his social adjustment. Later on, when it comes to economic adjustment, he feels the burden of this handicap even more. Not only is his appearance against him, but the poor vision which is generally present in the neglected squinting eye excludes him from many trades and callings. Particularly is such an individual severely handicapped in this day of the keenest competition for positions and the strict medical requirements for the entry into many industries and services. It is the author's belief that every squinting child has a just claim upon his parents, upon the profession, and upon society, which may later spurn him, that every effort be made to preserve and restore the function of his eyes.

Since it is generally the family physician or pædiatrician who is first consulted when a squint is noticed, it is necessary that these familiarize themselves with the nature of this trouble, the sequence of events which lead up to its development, as well as with the principles of its treatment.

THE NATURE OF SQUINT

Non-paralytic or concomitant squint only will be dealt with here. It must be emphasized that the deviation of the eyes does not in itself constitute the abnormality called squint, any more than the deviation of the spine in itself constitutes Pott's disease. Squint is a symptom-complex in which the following conditions are always or nearly always present. The two essential conditions always present are:— (1) deviation of the visual axes of the eyes; (2) defect in the fusion faculty. The other condi-

tions are:— (1) suppression of vision in the eye that is deviated; (2) amblyopia exanopsia, or low visual acuity in the deviating eye, due to disuse, resulting from neglect or inefficient treatment; (3) a refractive error; and (4) in rare instances, congenital amblyopia.

CLASSIFICATION

For purposes of this article the following classification will suffice:— (1) *convergence squint* and (2) *divergence squint.* Either of the above types may be: (a) Monocular—that is the deviation is always confined to the same eye. In these cases the fusion-faculty, though present, is very defective. If the squint is of any duration the vision in the deviated eye will be found to be very poor. Generally there is also a considerable refractive error. (b) Alternating—that is, sometimes one and sometimes the other eye deviates. In these cases the fusion-faculty is generally entirely absent. Vision is usually equally good in both eyes, and there is no refractive error of any significance.

Associated with the lateral deviation there is frequently some vertical deviation, the visual axis of one eye being on a higher level than that of the other. Many other terms used in the designation of the above types of squint will not be mentioned here as this would only lead to confusion.

ETIOLOGY

The essential cause of squint is a defect in the fusion-faculty. What then is this fusion-faculty? It has not been localized anatomically, but is apparently a coordinating function exercised by the higher brain centres; its rôle is to ensure binocular single vision. It develops gradually in the first six months of infancy, during which time the eyes are unsteady and may be observed to wander independently in the horizontal directions. As a rule, by the end of the first year, the fusion-faculty is fairly well developed, and the infant's eyes are generally steady and move together in the interest of binocular single vision. Full development of the fusion-faculty is generally reached before the end of the sixth year. In the presence of a well developed fusion-faculty the equilibrium of the eyes is not easily upset, but where it is defective or absent many precipitating factors will cause the eyes to deviate. Heredity plays an important part in the development of squint. The most important precipitating causes are the following.

1. A refractive error.—In the case of convergence squint it is generally hyperopia, or far-sightedness, often of a greater degree in the squinting eye. Now, hyperopes overtax the power of accommodation of the eyes, which also causes them to converge excessively. If the fusion-faculty in such an individual is insufficient to maintain single binocular vision under these trying circumstances, one eye definitely turns in, while the other eye is used for monocular vision. It is evident, therefore, that the deviation affects both visual axes, even though only one eye seems to squint.

In the case of divergence squint the refractive error is generally myopia, or near-sightedness. As in these persons the related accommodation and convergence power is exercised but little, the presence of a defective fusion-faculty causes the visual axes to deviate outward.

2. Congenital amblyopia, *i.e.*, low visual acuity in one eye due to some maldevelopment of the retina or optic pathway.

3. Structural anomalies. Congenital maldevelopment or birth-injury of one or more of the ocular muscles or of the orbital fossæ may make it difficult for the visual axes to maintain their normal relative direction.

4. Specific fevers, especially whooping-cough, often provoke squint where the equilibrium of the eyes is unstable, due to a defective fusion-faculty.

5. Violent mental disturbances, such as are caused by falls, severe fright, "convulsions", etc., may upset the equilibrium of the eyes where the fusion-faculty is defective.

DIAGNOSIS

This will only be dealt with in so far as it concerns the general physician or pædiatrician. Observant parents will often notice the incoordination of an infant's eyes in the first few months, and become worried over the possibility of it being a squint. This, as has already been noticed, is common in all infants because of the relative absence at that age of the fusion-faculty. However, if there is a more or less constant deviation of the eyes in any direction, a congenital anomaly or birth injury in some part of the visual apparatus should be suspected. The ordinary concomitant squint develops most

frequently between the first and third years of life.

In some children the presence of epicanthus is often mistaken for convergence squint. In this condition the nasal bridge is generally broad and the inner canthus of the eye extends over a greater portion of the sclera than normally, thus giving rise to the illusion that the eyes converge. By holding a light in front of the eyes the corneal reflex will be seen to fall in the centre of the pupil in both eyes, showing that there is no real deviation of the visual axes.

The detailed diagnosis of squint, entailing a careful history, a study of the character of the squint, the power of fixation, the muscular movements, the angle of deviation, the visual acuity, the refraction, the defect of the fusion-faculty, etc., must be left to the competent oculist. The determination of many of these factors may have to await the time when the child is able to cooperate.

TREATMENT

The treatment of squint should be carried out only by a medical eye-specialist, and should be begun immediately a squint develops. The following is a general outline of the handling of an average case of squint.

Having diagnosed the nature of the squint, the angle of deviation is measured by one of several methods. A record is made of the vision in each eye. In children too young to cooperate an approximate idea of the acuity of vision can be secured with patience, by the use of coloured objects of various size, etc. Atropine is ordered for several days in both eyes, after which the child is refracted. Any significant error of refraction is corrected with glasses. Glasses can be prescribed for children as early as one year of age. Where there is a marked error of refraction a child even at that age will show a marked preference to have the glasses on. Children's glasses can now be ground from safety glass and the fear of injury due to breaking is obviated. In early cases, where the vision in the squinting eye is still good, the correction of a marked refractive error will in itself tend to straighten the eyes. In cases where the squint is not abolished by glasses, a constant fight must be waged to prevent the vision from deteriorating from disuse. This is done by occluding or atropinizing the good eye for period of time. This must be done judiciously, for it is possible to transfer the amblyopia exanopsia, as well as the squint, to the other eye. Where the squint is of any duration and has not been efficiently treated the amblyopia in the squinting eye may be very marked. Every effort must then be made to develop the vision in the squinting amblyopic eye. Long periods of occlusion of the good eye must be practised, and the vision of the bad eye must be stimulated in various ways. No case should be considered hopeless until a real effort has been made to develop vision. Even in long-standing and neglected cases this is often developed to an astonishing degree. In any event, providing the amblyopia is not congenital, a distinct improvement can always be effected.

Once the refractive error has been corrected, and the vision in the squinting eye brought up to the limit of its possibility, training of the fusion-faculty is undertaken, as on this will depend the re-establishment and maintenance of the equilibrium of the eyes. Various stereoscopic instruments are available for this purpose. The most practical is the amblyoscope invented by Worth, or some of its modified and improved forms. Unless used intelligently, these instruments are of no value, and the so-called automatic muscle-training apparatus so widely employed by non-medical practitioners is often nothing but a "racket".

The measures outlined above must be applied in every case of monocular squint, irrespective of whether surgery will have to be resorted to or not. The object is not to eliminate surgery but to restore function. Surgery often has to be resorted to, but when practised in conjunction with other measures the results are far more certain. The idea is still prevalent that surgery should be delayed until the child is over twelve when the operation can be done under local anæsthesia. This is wrong. The operation should be performed whenever it is felt that the other methods in themselves, carried out efficiently, are not enough to restore the balance of the eyes. Wherever possible the balance of the eyes should be restored before the child begins school, in order that it might escape the psychic trauma which is occasioned by being a "cock-eye" or "cockie", or what not.

SUMMARY

Squint is not only a deforming defect, but it is also a disabling defect, since the function of

the deviating eye will deteriorate from disuse unless treated properly. The prevailing tendency to consider mostly the cosmetic correction is wrong and unjustifiable. The usefulness of many eyes is needlessly lost. A person with one good eye can do most things, but he has no reserve. Should anything happen to his good eye later on in life, he is virtually blind. Not only this, but the surgical correction of squint where the vision of the deviating eye is hopelessly poor and the fusion-faculty undeveloped gives no assurance that the eyes will remain permanently straight. We see too often recurrences of squint, or the turning of the eye later on in life in the opposite direction, in cases where operation without the necessary training of vision and fusion-faculty has been relied on. Much discussion goes on as to which of innumerable types of operation is best; new operations are being invented constantly. In the author's view most of this energy is misdirected. Any of the operations available now will yield better results if they are practised intelligently in conjunction with measures to preserve and restore function, which, in itself is the best stimulus for the eyes to remain straight.

CONCLUSIONS

1. The problem of squint should receive more adequate attention.

2. The profession and the laity must be impressed with the necessity of the earliest possible and continued treatment.

3. The goal must be restoration of function as well as cosmetic correction.

4. Treatment must only be through the hands of a competent medical eye-specialist.

5. The preservation or restoration of vision in the squinting eye and the training of the fusion-faculty should be undertaken in every case of monocular squint.

6. Surgery should be applied whenever it is in the best interests of the restoration of the equilibrium of the eyes, irrespective of the child's age.

7. Wherever possible the restoration of the equilibrium of the eyes should be completed in the pre-school age.

8. The intelligent and efficient application of the already established principles of treatment will yield better results in practically all cases.

9. A neglected case of squint is a reflection on, and is a challenge to, the child's parents, the profession, and the state of our society.

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DIFFICULTIES AND DANGERS OF FORCEPS DELIVERY.—E. D. Plass states that the application of forceps is the most important numerically of the various procedures aiming at delivery, since every physician who does obstetric work includes the instrument in his armamentarium and holds himself in readiness to assist delivery with its help, even though it may be the only surgical operation he is inclined to undertake. The procedure is also unique in that it is frequently performed under conditions which would be deemed a bar to satisfactory surgical measures of any other form. That the results are not more disastrous is a tribute to the patience and skill of the host of general practitioners throughout the country. Difficulties in forceps delivery ordinarily appear because the physician has not demanded fulfilment of the classic conditions for the safe application of instruments, namely: (1) The cervix must be fully dilated or easily dilatable. (2) There must be no disproportion between the head and the pelvis. (3) The position of the head must be accurately known, so that the blades may be applied in the biparietal diameter and rotation effected in the proper direction. (4) The membranes must be ruptured. The author emphasizes that the difficulties and dangers of the procedure may, however, be minimized by attention to the following general principles: One should use only recognized indications for forceps extraction. One should not be stampeded into thinking that it is a harmless operation. One should observe all aseptic principles and remember that sepsis constitutes a real danger. The instrument with which one is most familiar should be employed and one should remember that it is not so much the forceps as the man behind it that is important. Intermittent tractions should be employed, simulating the normal expulsive process as closely as possible, avoiding undue force. One should be prepared to do an episiotomy in order to avoid deep perineal lacerations.—*J. Am. M. Ass.*, 1932, **99:** 1817.

RADIATION IN CANCER*

BY DOUGLAS QUICK, M.B. (TOR.), F.A.C.S.,

New York

XVI

DURING the past few years, radiation has come to be accepted as of value in cancer therapy. The accumulated experience with radium and x-rays gives us to-day a considerable amount of rather accurate information on which to base the usage of these agents. At least, the empiricism of ten or fifteen years ago has been replaced by methods of reasonable accuracy, founded on the observation and experience of many workers. Such detailed information has not been widely disseminated. The average physician, especially in general practice, sees relatively few cases of cancer per year. Consequently there is a certain degree of misunderstanding as to the place of radiation in the cancer field.

Irradiation therapy is frequently regarded as a simple procedure, requiring very little equipment and very little time on the part of the patient for carrying it out. Fortunately, we are far beyond the period where a bit of radium is strapped on for a few hours or an exposure of x-rays given and the patient sent along to await results. All too frequently radiation is thought of in connection with advanced cancer only. It is true that irradiation therapy has been of great value as a palliative in the advanced stages of the disease. If it has accomplished nothing more, its use remains thoroughly justified on this score alone. Considering all types of cancer, the ultimate curability is between 20 and 30 per cent. The care, therefore, of the remaining 70 per cent plus, in a palliative way, frequently prolonging life in comfort and usefulness for several years, is of vital importance. The value of radiation does not stop with this group, however. Through the influence of the physical agents the curability rate is gradually being increased. The severity of operative procedures with their resultant shock and mortality is being gradually lessened. The extremely mutilating operative procedures are decreasing. There is no longer the necessity for performing eleventh-hour operations on advanced cases for the sake of "doing something." This is not meant to imply that operative surgery is being superseded by use of the physical agents. The treatment of cancer is largely a surgical problem. The care of a few groups has come to be a radiation rather than an operative surgical procedure. On the other hand, certain new operative procedures have come into the picture by reason of the use of the physical agents. Through the combined use of operative measures and radiation a substantial portion of the less desirable side of operative surgery in cancer is being eliminated. The actual amount of operative surgery is probably about the same. The severity of the procedures is decidedly reduced and the ultimate results improved. In other words, through the coordination of modern irradiation therapy and surgery a new type of "cancer surgery" is being well established. Unfortunately, the impression holds in many quarters that radiation and surgery are competitive measures. It is true that in the vast group of allied diseases coming under the general heading of "cancer", a few may be cared for equally well by surgery or radiation. The choice of procedure becomes a matter of election. Altogether, however, these two agents or methods are strictly complementary; they are not competitive. They represent the only means at our disposal to-day for the treatment of cancer. Progress is to be made through a closer coordination rather than on a competitive basis. A good deal of confusion rests upon the relative positions of radium and x-rays in irradiation therapy. Actually, there is very little overlapping of the two fields. X-rays are for external application only. They lend themselves to use over large areas of body surfaces. Economically, there is no practical limit to the quantity of x-rays available. Fortunately for progress in the work, the quality of therapeutic x-radiation is being steadily improved through the efforts of the physicist and the electrical

* Other papers in the series of articles on Physical Therapy can be found in the *Journal*, as follows, 1932, 27: 521, 612; 1933, 28: 30, 182, 246, 392, 521, 602; 29: 167, 290, 402, 497; 1934, 30: 24, and 173.

engineer. Radium for external application is limited in a practical way to small areas. Its chief use is within the body cavities and especially for direct implantation within tissues in the form of the element or filtered radium emanation (radon). It is in this latter form that it has its greatest usefulness in direct conjunction with operative surgical procedures.

The use of very large amounts of radium for external application is of interest in the cancer institutes, by way of clinical experiment. It serves as a comparative guide to x-ray therapy rather than as a competitive agent. From a practical standpoint the use of radium in this manner is economically unsound for routine clinical work. Well done x-ray therapy is preferable for external irradiation in everyday practice.

Another guide of great value in the selection of treatment methods, and one which is apt to be confusing, is that based on the histological study of tumour tissue. The histological "grading" of tumours has come to be very popular, and the relative radiosensitivity of a tumour is apt to be regarded as in direct parallel with the grade in which the tumour may be placed. An appraisal of the probable degree of radiosensitivity is dependent on many factors beyond the grade of the tumour. Grading is simply an indexing or cataloguing of the given tumour on the basis of its relative degree of cellular differentiation; it is dependent, also, to some extent on the personal equation of the individual tumour pathologist. No two tumour pathologists can regularly place exactly the same interpretation on every tumour. It is true, in a very general way, that the more anaplastic tumour responds more promptly and completely to a given amount of radiation than does the more fully differentiated one. The parallel therefore is obviously more nearly complete within the individual tumour groups than between tumours of different groups. There is no comparison in relative radiosensitivity between a grade I epidermoid carcinoma of the cervix uteri and a grade I (or grade II or III) adeno-carcinoma of the fundus uteri. Even within individual groups the degree of cellular differentiation on which grading is based is not a direct guide to relative radiosensitivity. The very delicate and free capillary blood supply of the more fully differentiated tumour may alone render it more radiosensitive than the tumour of lesser differentiation with a less sensitive blood-vascular apparatus. The anatomical location alone has a bearing on radiosensitivity. For instance, an epidermoid carcinoma, of whatever grade, at the base of the tongue, is relatively more radiosensitive than an epidermoid carcinoma of comparable grade in the tongue anterior to the base of the anterior tonsillar pillar. The normal histology of the portion of the organ involved is undoubtedly one of the many factors entering into an explanation of such a peculiar phenomenon as this.

The degree of advancement of a growth has its bearing on the relative radiosensitivity, and secondary deposits are more resistant than the primary growth. Recurrences are likewise more resistant to a given amount of radiation than is the primary. The extent of ulceration and secondary infection in a tumour does not appreciably alter the tumour grade, but it does reduce tremendously its response to irradiation. As a tumour progresses in its dissemination throughout the body the response to irradiation becomes progressively less, and out of proportion to the local response of any one given area; a general constitutional influence is evident. The age and degree of relative anæmia have a distinct influence on the response to irradiation, even though the histological structure of the tumour remains unaltered. The same is true of complicating general medical conditions. To recapitulate, therefore, the relative radiosensitivity of a tumour within a given tumour group is dependent on many factors beyond the simple histological grade of the tumour. There is no comparison in radiosensitivity, *histologically*, between the different major groups of tumours. This is a matter determined on the basis of clinical experience.

Within the various groups, however, grading and appraisal of relative radiosensitivity, taking note of all recognizable factors, is of great practical importance. The more radiosensitive tumours, speaking generally, call for a greater dependence in selection of the combination of therapy measures on the physical agents. The more resistant growths indicate a leaning more heavily towards operative surgery. In the extremely anaplastic growths, surgery, except to facilitate irradiation, is contraindicated. It is true of the fully differentiated growths (grade I) of whatever group, that a result once

obtained is much more likely to be permanent because of the lesser chance of distant and widespread dissemination.

Reference has just been made to the degree of greater dependence toward surgery or irradiation, based on the appraisal of relative radiosensitivity. This does not mean the employment of surgery alone or irradiation alone. There are few cases of cancer in which all three agents—surgery, radium and x-rays—do not play a part to advantage at some stage in their care. It is a matter of deciding the relative position of each in the individual case. Once this has been determined, the sequence of the procedures and the methods of irradiation best adapted to the case are to be decided.

Fortunately the empiricism of a few years back has been replaced in irradiation therapy by methods of reasonable accuracy. Dosage is better understood, and the most advantageous manner of apportioning the dosage is well in hand. In certain groups, notably in carcinoma of the head and neck, the minimum limits of dosage necessary for the varying degrees of differentiation are fairly well understood. Fully differentiated epidermoid carcinoma of the mouth, for instance, requires the equivalent of at least ten skin-erythemas in intensity of irradiation, to completely control growth. It is obvious that this cannot be delivered entirely by external irradiation; hence, implantation of radium in some form must be resorted to. On the other hand, anaplastic growths in the same location are prone to disappear completely with an intensity of three to five skin-erythemas. This may, with safety to the skin, be given by external irradiation (preferably by x-rays) if proper technical methods are observed. As to the sequence of the various measures one can only generalize. Ordinarily it is best to employ external irradiation first, follow this by the implantation if such be needed, and finish the procedure by the operative surgical measures if they be for removal of tissue. In the event that surgical exposure is necessary for the radium or radon implantation the two procedures become each a part of the one operation.

Absolute accuracy is essential if best results are to be obtained through the use of the physical agents. This is true of the external applications of radium or x-rays, and all the more so of radium needles or radon implantations. The latter are strictly surgical procedures, and as such are dependent for success on the same character of surgical accuracy as is the most delicate sharp dissection. The accuracy applies not only to technical procedure but to the careful calculation of radiation intensity along the lines of dosage intensity for the varying types of growth previously referred to.

The entire problem of present-day cancer therapy, if carried out to best advantage, in the light of information now available, extends well beyond the grasp of a single individual. It is a problem embracing the services of a physicist competent in the physics of radiation, an expert tumour pathologist, and a surgeon well versed in the fundamentals and details of irradiation therapy. If the latter is not available, the close cooperation of a radiation-minded surgeon and a medical radiologist is essential to success. The fact should never be lost sight of that the average cancer patient is also a person in the degenerative period of life. He or she is subject to the same general diseases of the period as are those free from cancer. While the cancer clinician is caring for the malignant disease there is ample need for the expert services of the internist or family physician. Active supporting medical measures are necessary to the successful carrying through of the average case.

In discussions on cancer therapy, attention is usually focussed on measures aimed at "cure". Since the majority of cases are ultimately incurable, great care should be given in the preliminary appraisal to determine whether or not the case offers a reasonable hope for cure. If there is a reasonable chance, then every effort ought to be exerted in that direction and to the exclusion of all other considerations. If such chances are very remote, the procedure planned should give consideration to the comfort of the patient from day to day and week to week. A great deal of needless suffering may thereby be avoided. Prolongation of life alone, without reasonable comfort in the interim, is of doubtful value except perhaps in a few instances. Palliative measures should be of less severity and of less intensity than measures aimed at cure. It is the opinion of the writer that a good many simple operative procedures for palliative purposes only are too frequently frowned upon by general surgeons.

The coordination or combination of surgery

and irradiation may to advantage be considered from various angles. The popular conception of this centres around pre- and post-operative irradiation. There are numerous instances where post-operative therapy is the only alternative—the operation may be necessary to establish the diagnosis in cases of difficult clinical differentiation. However, in operable cases, with little doubt as to the clinical diagnosis, pre-operative irradiation to the maximum of skin tolerance is, in the opinion of the writer, the method of choice. It permits of the maximum of favourable reaction on the part of all tissues concerned, both of tumour and tumour-bed. Once the blood supply has been interfered with and post-surgical inflammatory congestion present, the most advantageous reaction cannot be expected. The scar will not permit of the same radiation intensity. It is a comfort extending beyond the point of mere theory to operate on a regressing tumour rather than on one in which dislodgment of a tumour embolus during the manipulation may mean a distant metastatic deposit. There is no loss through waiting for the intensity of skin-reaction to subside before operating. It assures prompt healing and permits of carrying on the operative procedure during the safest period—the period of beginning fibrosis.

One of the largest fields for irradiation therapy is that carried out at the time of the surgical operation by some form of implantation, and under varying conditions. Personal experience is strongly in favour of filtered radon implants for this type of work. They lend much greater facility and are attended by less technical risk. Many cases regarded as operable are approached surgically only to find as the operation advances that a clean wide removal is impossible—a portion of the tumour or a suspicious area must be left. Unless radon is available at the moment, the best chance for efficient and accurate irradiation, often with chance for complete control, is lost. There are many instances, of which certain of the metastatic cervical nodes furnish the best examples, where surgical exposure for radon implantation is attended by much greater accuracy and safety than would be the case were the implantation attempted through skin puncture. Such surgical exposures are simple procedures, usually done under local anæsthesia. Neck exposure for ligation of vessels often affords an excellent opportunity for implantation as well. Certain primary growths, difficult of satisfactory technical approach for implantation, may likewise be exposed directly. Intrinsic carcinoma of the larynx which has extended below the cord level is a good example. It frequently occurs that surgical access and drainage are both necessary even though the direct treatment of the malignant growth is best handled by irradiation. Such circumstances are usually encountered in dealing with cancer of the superior maxillary antrum and the accessory sinuses.

Secondary invasion of bone by new growth is very resistant to irradiation. Not only is the tumour-bed unfavourable but it is essentially an area of osteomyelitis as well as of tumour growth. Destruction of the growth by irradiation and subsequent surgical removal of bone give better results than a surgical resection alone. This picture is encountered most frequently perhaps in growths of the soft parts adjacent to the lower jaw. The limited surgical removal can often be done through the mouth and not only is a safer procedure but one attended by a lesser deformity as well.

Ulcerating tumour-growth is always attended by varying degrees of sepsis; this not only interferes with a normal reaction to irradiation but it increases pain, deteriorates the patient's general condition, and prolongs unnecessarily the period of healing. Under such conditions it is at times advantageous to use the ulcerating tumour mass as a "holder" for radon implants until such time as sufficient irradiation has been delivered, after which the entire area is removed by one of the cautery methods. This permits of proper irradiation and at the same time permits of a surgical cleaning up with consequent lessening of pain, relief from sepsis, and a hastening of the healing period.

One of the most complete examples of the combined use of surgery, radium and x-rays is to be found in our method of dealing with intra-oral epidermoid carcinoma. All cases accepted for aggressive treatment receive, first, x-radiation through both sides of the neck covering the lymph-node-bearing areas and with the field extended to take in the primary growth as well. Following this, and in all but the extremely anaplastic growths, the primary tumour is implanted with radon. Routine block-dissections of the neck are not done. If there are no palpable nodes in the neck there is no further

neck treatment. The patients are kept under routine observation. If a node appears, one of two procedures is followed. If the growth be of adult type, fully differentiated, the patient in good condition, the primary growth controlled or under control, and the node in question encapsulated, a complete unilateral dissection is done. Under all other circumstances, a limited surgical exposure under local anæsthesia for purposes of direct radon implantation is resorted to. If the primary growth is not controlled there is no object in doing a dissection of three or four hours' duration. Elderly patients and those in poor general condition are not equal to it. Few cases where the disease has perforated the capsule of the node are cured by the most radical dissection. The undifferentiated growths do better with irradiation alone than with any type of removal. This illustrates the fact that operability limits are considerably narrowed under the influence of associated irradiation in dealing with cancer of the mouth and neck.

The same is true, but not to the same degree, in breast cancer. The complete operation, plus pre- or post-operative irradiation, is limited to the more favourable group. In those with extensive and high axillary node involvement, irradiation is undoubtedly preferable to the unhappy results of attempted radical mastectomy.

There are a few major groups of cancer in which surgery has been largely replaced by radiation. Growths of the skin come chiefly within this class. Cancer of the cervix uteri is entirely a problem for irradiation. On the other hand, cancer of the fundus uteri, a disease differing both histologically and anatomically from that of the cervix, remains in the field of operative surgery, with or without preliminary irradition, depending on the attitude of the individual operator.

RUMINATION: WITH REPORT OF TWO CASES*

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FROM a perusal of the literature on the subject it would appear that rumination in adults is of comparatively infrequent occurrence. Whether the comparative paucity of such cases in the literature is due to actual infrequency or to the fact that the condition is not of a serious nature is difficult to determine; it is, however, sufficiently interesting to warrant a description of two cases and of the treatment employed.

Rumination is described as a usually inherited or, more rarely, acquired ability to regurgitate, re-chew and re-swallow the food partaken of. Although not generally recognized as a disease, the act is so unpleasant to some ruminants as to prompt the seeking of medical advice. In adults it occurs more frequently in males than in females. Most observers report that certain foods are more readily ruminated than others. This is probably in part determined by the taste of the food, and probably accounts for the fact that ruminants do not perform well during x-ray examinations unless given a specially prepared barium meal containing food they like. Kohlmann[1] notes that liquids are badly ruminated; beer, bread or potatoes, taken alone, do not come up. The first of my patients volunteered the information that when the food was not to his taste he did not ruminate. Ruminants usually eat much and fast, and, according to Kohlmann, they nearly always take alcohol.

It is doubtful whether the rumination of adults and of infants is related, in the sense that it is carried over from infant to adult life (Kohlmann). On the other hand, there appears to be considerable similarity in regard to underlying causes, since in both an anatomico-pathological basis is frequently to be found and the psychic factor plays a part. The rumination of adults comes on usually during the second decade, without, so far as it is possible to ascertain, having been present in infancy, although Ridder[2] states that it can occasionally be traced to childhood.

Strouch[3] and others consider that rumination in infants is usually due to local pathological

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causes, which in time, and even after the disappearance of the primary pathological cause, becomes a pathological reflex. Another factor in infants is lonesomeness, leading to rumination as a method of occupation (psychic factor). Not infrequently infant addicts to rumination are mental defectives or idiots.

In the adult, rumination is believed to be hereditary and rarely acquired after birth. This is also Kohlmann's opinion. In many cases of transmission of this condition, the children had no knowledge of the fact that one or other parent ruminated, (excluding in these cases the factor of imitation). It is believed by some observers, including Kohlmann and Müller,[4] that the condition is atavistic in nature. In support of this contention they point to the frequent occurrence of the disturbance in families; to the fact that many ruminants prefer to ruminate while lying down; and to the presence, as found at several autopsies (Luschka; Arnold; Müller), of a constriction ring in the body of the stomach, dividing it into two halves—the saccus cardiacus and the tubus gastricus. These findings fit in with Schwalbe's conception of the human embryo stomach.

The causes of this condition are little understood, as evidenced by the numerous conceptions offered. Patency of the cardia [vagus neurosis; vagotonia of the dilator cardiæ (Zweig[5]); paresis of the cardia or reflex neurosis with temporary relaxation of the cardia (Friedenwald[6]); interference with the normal closing of the cardia and the presence of relative cardiac patency (Ridder[2])] is given by most authors as the main cause of the disturbance. Kohlmann disputes the vagus neurosis theory, while admitting that certain facts point that way.

The belief that neurasthenia is a major factor in the etiology of rumination is maintained by Zweig, who classes rumination under "nervous dyspepsia", as a disease occurring as a result of hysteria, neurasthenia, idiocy, etc. Friedenwald and Ridder support this theory, while Kohlmann maintains that most true ruminants (adult) are physically and mentally healthy. Kohlmann, Müller and others contend that rumination is hereditary in most cases—a type of atavism, while Friedenwald and Ridder state that it is hereditary in some cases only. Other factors of etiological significance are: imitation (Ridder, Zweig); worry and excitement (Friedenwald); hasty eating (Friedenwald, Zweig); purposeless eating and infections (Ridder).

All authors appear to agree on the point that patency and dilatation of the cardia are present, and most of them believe that this is actually the cause of rumination. This view appears untenable. The so-called cardiac sphincter is not a well developed sphincter like that of the pylorus. Alvarez[7] has seen barium suspensions run out of patients' stomachs when in the Trendelenburg position, and also calls to mind that there are persons who cannot bend without regurgitating. He further points out that the efficiency of the "valve" doubtless varies in different persons, since some regurgitate and vomit with ease, while others do so only with the greatest difficulty. Zaaijer[8] states that, strictly speaking, there is no sphincter in the cardia, even though prolongations of bundles of gastric muscle fibres, running circular and elliptical courses, can produce during contraction a more or less circular closing of the cardia. Apart from this, the so-called supporting bundles deepen the plica cardiaca and also produce a valve-like closure between the stomach and the œsophagus. To what extent relaxation of these fibres plays a part in the opening of the cardia is little understood.

Kelling[11] pointed out in 1901 that because of the diagonal manner of entry of the œsophagus into the fundus, anatomical conditions may be produced which will cause passive closing of the cardia when the intragastric pressure reaches a certain level, and opening when it rises to a higher level.

The work of Chevalier Jackson[9] and Mosher[10] indicates that the sphincter itself does not form the only means of dividing the stomach from the œsophagus. The additional factors lie in the manner of entry of the œsophagus into the abdominal cavity (*i.e.*, through the liver tunnel), and the pinch-cock action of the diaphragm, the latter opening at the proper moments in the deglutitory cycle.

It would appear then, from the anatomical point of view alone, that, even though the cardia is dilated to the extent of admitting a two-mark piece, as in Müller's case,[4] and offers an especially slight resistance to the passage of sounds, as well as a diminished power of closing (Singer, Lederer, Pässlich and Strauss, quoted by Ridder[2]), this in itself is not sufficient to explain rumination, since another line of defence against

the welling up of gastric contents into the œsophagus is present. Further, this weakness of the cardia, not necessarily with dilatation, appears to be a characteristic of the human race. According to Huntington,[12] the weakness of the cardiac sphincter of man is probably an inheritance from those lower forms of life in which there is little division between the stomach and the œsophagus, and in which disgorging of food is physiological. Weakness of the cardia thus appears to be a characteristic of the human race, protection against spontaneous evacuation of the stomach in horizontal and inverted positions (as in acrobats) being afforded by the additional factors named. Patency of the cardia, however, appears to be abnormal; but even this cannot be the cause of rumination.

There are two distinct ways in which the cardia is normally caused to open. One may be said to be directed by influences from above, as in swallowing. Inhibition of the cardia is initiated by the swallowing act; occasional œsophageal peristalsis, the milking action of the diaphragm and gravity, all play their parts in permitting the entry of foods and liquids into the stomach. Small amounts of gastric contents frequently enter the lower œsophagus in patients with disturbed gastric function, and sometimes in normal persons. This occurs without conscious perception of the motor activity or mechanical process involved. On the other hand, in the upward flow of gastric contents in sufficient amount to reach the mouth, the process must (except where this is due to change of posture, as in bending, etc) in part at least be different. Reflex inhibition of the cardia, as the work of Carlson, Boyd and Pearcy[13] and others appears to indicate, can occur through stimuli arising from any of the numerous parts of the body from which vomiting can be started. But in order to produce upward flow gravity must be overcome by some expulsive movement. This is accomplished by utilizing the diaphragm, abdominal muscles and the stomach as a pump.

It appears to be quite obvious that the presence of an abnormally relaxed and patent cardia cannot in itself be responsible for rumination, since, on this basis alone, it would be necessary for the ruminant to stand on his head, or at least to lie in a partly inverted position. Further, dilatation, or even abnormal patency, is not necessary to make rumination possible, since regurgitation (of gas and food) occurs from time to time in perfectly normal individuals, and since it has been shown that reflex relaxation of the cardia can be initiated by stimuli arising from many parts of the body. The patent or dilated cardia certainly cannot in any way be held responsible for the re-chewing and the re-swallowing of the food, nor can it explain the cessation of rumination when the gastric contents become acid. To the author, the presence of a patent or dilated cardia appears to be rather the result than a cause of rumination. It would seem that the persistently recurring stretching of the cardia (about 120 times daily) by the sudden direction of a considerable degree of hydrostatic pressure against it from below would tend to weaken and relax a sphincter that is very weak at best. The œsophagus has similarly been found to be frequently dilated. Cases have, however, been reported in which no dilatation of the œsophagus was present (Acheles' case and also that of Gulat-Wellenberg, quoted by Kohlmann, and in both of the author's cases). Dilatation of the œsophagus, according to Kohlmann, is found in all old cases. He finds this dilatation puzzling, since the cardia is usually patent and easily passable. He feels it may be due to excessive use of the œsophagus during rumination. Zweig[5] states that frequent regurgitation leads often to an atony of the lower third of the œsophagus. It would be reasonable to believe that the mechanism suggested as being responsible for patency of the cardia is also responsible for dilatation of the œsophagus when present, *i.e.*, the very frequently recurring transference of hydrostatic pressure of the gastric contents under the influence of the expulsive mechanism.

CASE 1

M.S., aged 29. August, 1927. The patient was a professional man of more than average intelligence. Since the age of ten he had been regurgitating food after meals. The regurgitation began toward the end of the meal or shortly after, and continued for as long as two hours, never less than one. There was no nausea or other discomfort associated with the act. The regurgitation was repeated every two or three minutes with regularity. This went on until the food became somewhat "bitter and burning". The food brought up was re-chewed and swallowed, except when the patient was in the presence of others, and then the food was re-swallowed without re-chewing. The act to him was distasteful, and became particularly so when the regurgitated food began to acquire an acid taste. He was particularly anxious to be cured of the condition, as he found it embarrassing when in the presence of others. He was made aware of the oncoming of a regurgitation by an involuntary (?) contraction of the lower abdominal muscles, and could also bring it on at will.

He complained of an occasional burning sensation at the level of the umbilicus which came on about half an hour after meals and lasted about an hour. He had been subject to this, on and off, for the previous ten years. His appetite was good and he ate heartily and quickly. The bowels were regular. He was one of a family of four, and no other member of the family was subject to the condition. To his knowledge no one in either his father's or mother's family had been subject to it.

Apart from tonsillitis, colds and influenza, he had always been well. He did not smoke or drink.

The patient was well developed, but somewhat inclined to obesity. The physical and laboratory examinations were negative, with the exception of the presence of tenderness in the right lower quadrant.

X-ray examination.—The barium meal entered the stomach readily; the œsophagus was not wider than normal. The stomach was steer-horn and the pylorus a considerable distance to the right of the spine, but not fixed. The peristalsis was indolent and a small sessile cap was seen. The emptying of the stomach was very slow; within the period of a half-hour examination the meal entered the duodenum only four or five times. Considerable secretion was present in the fasting stomach. The patient did not regurgitate any barium throughout the examination, and volunteered the statement that the barium was too heavy and therefore did not rise. At six hours the stomach was empty. The patient was requested to return, and this time a meal of bread, cheese, egg and tomato was given; with this the patient had a large glass of thick barium-malted-milk suspension. Within ten minutes after taking this meal the patient began to regurgitate. Observed during this period, the cardiac end of the stomach slowly distended, the pyloric half contracting considerably at the same time. There was no line of demarcation between the contracting and dilating portions of the stomach, but there was a gradual narrowing of the stomach toward the pylorus, the stomach assuming a pear-shaped form. As this occurred, the barium flowed easily through a patent cardia into the œsophagus and mouth, and was then swallowed. This was repeated every few minutes. Attempts were made on several occasions to radiograph the act, but the speed with which this occurred made this impossible, even when the patient operated the foot-switch himself.

The patient could tell when a regurgitation was coming, by feeling what he stated was an involuntary contraction of the abdominal muscles. During regurgitation the following sequence of events was observed. The lower abdomen was drawn in; this contraction of the abdominal muscles seemed to travel upwards in the form of a wave. When this wave reached the epigastrium, the chest expanded a little, the diaphragm was fixed in inspiration, and the cheeks become ballooned with the regurgitated food. The whole act occupied perhaps the tenth part of a second. The colon was in every way normal, but the appendix remained visualized and tender for five days after the colon emptied.

The patient received a very careful explanation of his condition. General advice and instructions as to diet were given. Since he had previously been treated for what was thought to be pyloric spasm with large doses of atropine without relief, this drug was not further employed. In 1926, Januschke and Lasch[14] described the action of pyramidon on isolated intestine. The presence of small quantities of this drug in the bath produced a marked lowering of intestinal tone and in larger concentrations arrest of peristalsis. Januschke believed this to be a direct action on the smooth muscle. On this basis, and in the absence of any more rational treatment, grs. III of pyramidon in diminishing doses were given t.i.d.

The patient was seen again several months later, and since then at longer intervals, the last time in May of this year. He stated that he had not been free of the condition throughout this period. Worry and emotion invariably brought on a recurrence. He could, whenever he desired, arrest the rumination by being careful with his diet and taking a course of pyramidon. (Amidopyrin was later substituted for pyramidon, since its action was found to be the same and the cost less). This invariably brought relief, which lasted until emotional stress caused a relapse.

CASE 2

G.F., aged 32. July, 1928. For the past fifteen years he had been subject to regurgitation of small quantities of food after all meals. He began to regurgitate about twenty minutes after the meal and continued to do so every two or three minutes until the regurgitated material became sour. Lately, he had been having pain in the epigastrium, which came on about one and a half hours after meals and lasted about fifteen minutes. This pain was sharp and not influenced by the taking of additional food. He desired relief for his pain, and was not concerned about the regurgitation.

The patient was a heavy and fast eater. After regurgitating he re-chewed the food and swallowed it again. He did not lie down to ruminate. He stated that he could tell when the food was going to come up; he then took a deep breath, the abdominal muscles contracted, and a mouthful of food came up. He also complained of a tendency to constipation, bulimia, and gas-eructations.

No one else in the family was subject to this condition, and, to his knowledge, no one in the families of his parents.

The patient was a labourer and had always been well. He drank beer in moderation and smoked twenty cigarettes daily.

His intelligence was a little below the average, but he did not exhibit any mental abnormalities or physical stigmata of degeneration. He was well developed and nourished. The teeth were bad; many were crowned, but there was adequate masticating surface. Apart from the above and a moderate degree of tenderness in the right upper quadrant and epigastrium, the physical findings were negative.

Gastric analysis—fasting contents: bile-stained, free HCl 0; total acid, 15; starch, 0. One hour specimen: free HCl 28; total acid, 60.

X-ray of the gall bladder.—The gall bladder filled faintly and concentrated poorly.

Barium series.—The patient was instructed to eat the sandwich he brought with him and to drink the barium suspension from time to time. The œsophagus was not dilated. The stomach was small and J-shaped. The tone was good, the peristalsis shallow. There were no defects or irregularities, and a good

cap was seen. Forty-eight-hour colonic stasis was present. An attempt was made to view the act of rumination, but no satisfactory result could be obtained. This was probably due to an inadequate mixing of the food with the barium suspension. During this period regurgitations were proceeding with regularity.

The man was instructed in the care of his bowels and given pyramidon grs. III, t.i.d., for one week. On August 16th he was a good deal better in every way and regurgitated only two or three times after meals. He was seen again on September 6th, not having taken pyramidon during the interval. The rumination had almost entirely ceased, except occasionally after breakfast, and then at most only two or three regurgitations.

This patient was not intelligent enough to understand an explanation of the condition and no attempt was made to point out the need for voluntary control. He associated the rumination with the epigastric pains, and his desire to get better was undoubtedly a factor in arresting the rumination, at least during the period he was under observation. The administration of medicine may, of course, in itself be construed to represent psychic treatment. After this visit the patient was not seen again.

SUMMARY

A short review of the literature on rumination is given.

A possible explanation of the frequent presence of a patent cardia and dilated œsophagus in ruminants is given.

Two cases of rumination are reported.

A description is given of the rumination cycle observed with and without the aid of x-rays.

The treatment employed in these cases is described.

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Case Reports

A CASE OF HYPERPARATHYROIDISM ASSOCIATED WITH HYPERTHYROIDISM

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The patient, an unmarried man, aged 33, was admitted to hospital on June 4, 1931. He had lived all his life in the backwoods, mainly occupied in taking out timber. During the last three years he had been a little "nervous". He had worked all the previous winter, logging. Since then he had noticed steadily increasing nervousness and weakness, especially in his legs. He had lost 15 lbs. in weight in three months.

Examination.—Pulse 96; temperature 98°; blood pressure 125/90. His extremities were warm.

There was moderate fine tremor in the hands, with associated coarse tremor. Moderate exophthalmos and some retarding of the lids. Some general muscular spasticity, particularly in the legs; the muscle and tendon reflexes could not be elicited on this account. There was definite muscular weakness, particularly in the legs. His gait was normal, with slight swaying station. He over-pointed with the right hand. Sensation was normal. The pupillary reflexes were normal; no squint; no nystagmus. There was a smooth, general, but moderate, enlargement of the thyroid gland. Weight 137 lbs. Basal metabolic rate, plus 23. The Wassermann test was negative. Hæmoglobin, 90 per cent; red blood cells, 6,612,500. Urine: specific gravity 1020; alkaline, a slight trace of both albumin and sugar; diacetic acid negative; the sediment consisted of earthy and triple phosphates.

Diagnosis.—Hyperthyroidism, with a query as to why there was so much muscular weakness in the presence of only moderate thyroid toxicity, the muscular spasticity remaining unexplained.

Fifteen days of iodine therapy brought about some improvement. A subtotal thyroidectomy under local anæsthesia (1/1000 nupercaine) was performed on June 24, 1931. The pathologist reported simple goitre, noting pale colloid as the only evidence of hyperplasia. The patient made a good recovery and was discharged on July 5, 1931, in fair condition, but still weak. Pulse 80; temperature 97.2°; basal metabolic rate plus 23 (unchanged, in spite of a rather extensive thyroid resection). He was sent home under iodine therapy and instructed to report back in a month.

He was re-admitted on August 3, 1931, at which time these notes were made. He had not done well. Nervousness had improved, but muscular weakness had increased. He could only shuffle along, and this with support from two canes or a helping hand. He could not support his entire weight on one leg if his knee was even slightly flexed. There was marked general muscular weakness. His appetite was poor, and he had lost 4 lbs. in weight. The eye-signs had cleared up, except for slight exophthalmos. All reflexes were greatly diminished. The muscles were spastic and flabby, with a coarse tremor. A skiagram of the bones showed some thinning of the cortex, but no cysts. Kidney plates were negative for stones. The urine was negative, except for a trace of sugar, which cleared up after two days in hospital under normal diet. Red blood cells 4,500,000; hæmoglobin 90 per cent; basal metabolic rate plus 2; blood calcium 17 and 18 mgm. per 100 c.c. on two successive days. No blood phosphate estimations were done. A mass, the size of a small marble, could be felt on the left side of the neck. This was suspected to be a parathyroid tumour.

Diagnosis.—Hyperparathyroidism.

On August 7, 1931, the tumour was cut down upon under local anæsthesia, but found to be thyroid tissue. A piece was removed for section; also the region was thoroughly explored for parathyroid. As none was found, an effort was made to interfere with the blood supply of the hidden parathyroid. That evening the nurse noted slight muscular twitching and calcium lactate, one drachm, was given, thoroughly dissolved in water. There were no further signs of hypoparathyroid reaction. Post-operative progress was good.

August 17.—The blood calcium was down to 11 mgm. He was discharged on August 23. Weight 133. Slight immediate clinical improvement was noticed. He was re-admitted on September 14, 1931. There was but slight improvement in muscular strength. Temperature 98°; pulse 70; basal metabolic rate plus 3. Blood counts and urine were normal. The blood calcium was up a point, to 12 mgm., and it was felt that something more should be done to reduce parathyroid activity. On September 17, 1931, with local anæsthesia, the thyroidectomy scar was excised, the whole thyroid area opened up, and a thorough search made for parathyroids on both sides. Some bits of thyroid gland were removed, but no parathyroids were found. Again deliberate attempts were made to interfere with their circulation.

Post-operative recovery was good; no tetany. He was discharged on September 30th, with definite clinical improvement, muscular spasticity being especially lessened. He has continued to improve slowly. The following is a quotation from the patient's father's letter, dated July 6, 1933, 23 months after the last operation. "I am pleased to say G. is fine. He helps his brother in the woods, cutting wood, and enjoys himself in doing so. As far as I can see he is able to do a man's work at most anything. He weighs 166 dressed." This was a gain from 133 without clothes. On September 16, 1933, the blood calcium was 13.6 mgm. per 100 c.c. and the basal metabolism plus 14.

COMMENT

1. The hyperparathyroidism accompanied the hyperthyroidism and remained after thyroidectomy had been performed.

2. This appears to be the first of such cases reported.

3. It seems evident that the abnormal parathyroid function was the main cause of the patient's symptoms. His thyroid symptoms had existed for some three years before the onset of the progressive muscular weakness and spasticity. These latter signs increased after an otherwise satisfactory subtotal thyroidectomy.

4. The first attack on the parathyroids produced no result in the form of parathyroid tissue removed. However it did produce a slight tetany the evening after the operation and a lowering of blood calcium from 17 or 18 mg. per 100 c.c. to 11; *i.e.*, to normal limits. The second attack was possibly not justified clinically. True, the blood calcium had gone up a point, but, it now appears, it is better to wait a longer interval to allow of clinical improvement, as it takes some months before the normal calcium content of the tissue can be replaced when it has been exhausted by hyperparathyroid activity.

5. The result, after two years, is satisfactory, in spite of the fact that no parathyroid tissue was removed.

I am grateful to Dr. C. B. Waite, of Peterborough, Ontario, for his assistance in carrying out the laboratory and the neurological work in this case.

PRIMARY LYMPHOSARCOMA OF THE ILEUM WITH PERFORATION AND DEATH FROM ACUTE PERITONITIS*

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While primary lymphosarcoma of the ileum is not of uncommon occurrence it is rarely complicated by perforation. It is chiefly for this reason that the report of a case seems justifiable.

Lymphosarcoma of the intestine is found most frequently in the lower ileum according to Ewing,[1] who gives a detailed description of the condition. He states that rarely marked stenosis results and perforation may occur. Chronic peritonitis and chylous ascites are often observed. Ullman and Abeshouse,[2] in an extensive review of the reported cases, say that the age at which the tumour is found is from the first to the third and fourth decades, with an average of 33.19 years. The relative proportion of males to females is given as two to one by Weeden.[3] The etiological factors involved are unknown. Traumatism, tuberculosis, syphilis, typhoid fever, previous operations, chemical and bacterial irritants are mentioned by Ullman and Abeshouse as having a possible bearing.

Clinical history.—(Note—the patient was unconscious on admission and the clinical notes were later obtained from the attending physician who referred the case to hospital). W.W., a white farm labourer, aged 55 years, married, entered Victoria Hospital, London, Ontario, on August 27, 1932, at 1.30 a.m. Except for typhoid fever 20 years before he had always been well. The family history was irrelevant.

From August 12th to 19th the patient said he "felt out of sorts". On August 21st he complained of vague gastro-intestinal symptoms. He worked all the following day. On the next day he worked a short time, but complained of rather sharp intermittent pain in the abdomen. This continued throughout the next day. On August 25th he ploughed all day. During the night the pain in his abdomen was severe and was accompanied by a mild diarrhœa. The next morning he was seen by a physician for the first time. His abdomen was rigid and the pain localized below the umbilicus in the mid-line. His temperature was 100.1° and his pulse rate 82. In the afternoon he felt more comfortable, but in the evening the pain recurred. He was again seen by the physician at 11.30 p.m. and after morphine had been administered he was removed to the hospital at 1.30 a.m. on August 27th.

Shortly after admission a surgical consultation was held, but immediate operation was not advised. At 3.45 a.m. the patient received 250 c.c. of 5 per cent glucose. He was very restless at that time and died at 4.40 a.m. on August 27th.

Laboratory findings. — Blood count — leucocytes, 6,150, with 6 per cent mature and 70 per cent young polymorphonuclears; 19 per cent lymphocytes, and 5 per cent myelocytes.

Post-mortem examination.—An autopsy was performed six hours after death. External examination revealed a well-developed, well-nourished male, 73 inches in length; apparent weight 210 pounds. Nothing of importance was noted externally except a well marked pitting œdema of the left leg.

Significant changes were found in the peritoneal cavity, ileum, liver, spleen and both kidneys. On opening the abdomen, approximately 2000 c.c. of turbid, puriform, straw-coloured fluid were found. A perforation of the small intestine presented midway between the umbilicus and the symphysis and a little to the right. The omentum and peritoneum were covered with fibrino-purulent exudate.

On opening the small intestine at a point in the ileum near the jejuno-ileal junction, 12 feet from the ileo-cæcal valve, there was an ulcerated area roughly circular in outline, measuring 6.5 cm. in its greatest diameter. This area consisted of a soft, greyish-white thickening with erosion of the mucosa; it was flat, with very gently terraced margins. At the centre of the ulcer was a thinned-out portion, measuring 1.5 cm. in diameter, and at its central point there was a small perforation, approximately 2 mm. in diameter. The ulcer had a tendency to encircle the lumen rather than to spread longitudinally. The peritoneal surface surrounding the perforation presented a well-marked layer of fibrino-purulent exudate. The whole small intestine was distended with gas.

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The portion of ileum immediately above the ulcer appeared to be similar to that immediately below, that is, there was no obvious sign of obstruction. On section across the ulcerated area the cut surface presented a uniform greyish-white infiltrated appearance extending throughout the whole thickness of the intestinal wall. The involved area was readily detected from the serous surface on account of the thickening and infiltration which outlined the site of the ulcer and did not allow the intestine to collapse at this point.

The adjacent regional lymph glands, including those attached to the ileum and those in the adjacent mesentery, were enlarged, soft, and greyish. The largest of these was about the size of a large egg, and on section showed a soft necrotic centre and surrounding infiltrating tumour which appeared to have completely replaced the lymphoid tissue.

Two yellowish nodules were present on the lower surface of the right lobe of the liver; also a small whitish nodule at the lower extremity of the spleen and several yellowish nodules on the surface of both kidneys.

Other findings, confirmed by microscopic examination, were: acute congestion of the lungs, chronic passive congestion of the liver, chronic diffuse nephritis, and benign glandular hyperplasia of the prostate gland.

Microscopic examination revealed a complete erosion of the mucosa of the ileum and replacement by round, deeply-staining, tumour cells which resembled large lymphocytes. The ulcer itself was shelving and at its central point was perforated. On the mucosal side near the perforation an area of fibrino-purulent exudate was noted. The tumour was extremely cellular, with a scant delicate reticulum. The tumour cells invaded the whole intestinal wall to the serosa. The peritoneal surface presented a well marked layer of fibrino-purulent exudate.

The regional lymph glands showed a complete disorganization of the structure and replacement with tumour growth similar to that above described. The omentum also showed marked infiltration with tumour cells. The section of liver contained foci of tumour cells in which there was infiltration with necrosis and atrophy of the liver cells. The mesenteric lymph glands and kidneys showed similar infiltration with tumour cells.

DISCUSSION

On account of the short period in hospital before death and the extreme gravity of the patient's condition further clinical investigation was not possible. As far as causative factors are concerned in this case the only relevant feature seems to be the history of typhoid fever. This is mentioned by Ullman and Abeshouse[2] as occurring in a sufficient number of the cases which they reviewed to warrant considering it a factor.

It is interesting to note the extreme brevity of the patient's illness. The extent of the period during which there was any notable disturbance in health was approximately two weeks. Up to two days before death the patient was able to carry on at his daily work. Apparently it was not until there was definite involvement of the peritoneum that marked symptoms were noted. Weeden[3] reports a fatal outcome in 9 to 18 months in untreated cases.

The clinical picture is so confusing that a diagnosis is very rarely made before operation or autopsy. The x-ray findings, together with evidence of malignancy of short duration in a young person should arouse suspicion. Most often the picture is that of a chronic or acute obstruction although the condition has very often been mis-diagnosed acute appendicitis.[2] In our case no history is given of any change in the bowel movement until two days prior to death at which time he had a mild diarrhœa.

The age of this patient is considerably above the average given by Ullman and Abeshouse. Their figures show that the condition is more frequent in the first to third and fourth decades. The site of the primary growth, in the ileum, is in accord with their findings, which show the ileum to be the most common site, with the jejunum and cæcum next in frequency. This case is of special interest because of the complication of perforation.

SUMMARY

A case of primary lymphosarcoma of the ileum with post-mortem findings is described. Death was due to perforation of the ileum at the site of the primary tumour, with resulting acute generalized peritonitis. This is a rare complication in lymphosarcoma of the intestine.

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Clinical and Laboratory Notes

A DEVICE FOR MOBILE FOOT SUSPENSION

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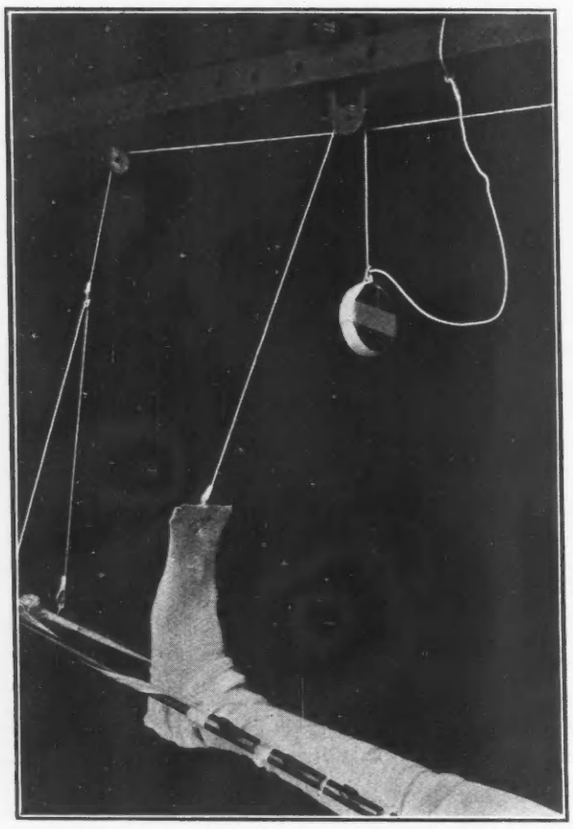
In all instances of lower limb suspension for fracture or other lesion not requiring ankle fixation, mobile foot suspension is of decided benefit in bringing comfort to the patient and in maintaining healthy joint surfaces of the ankle and foot. Many schemes have been adopted in the past, all of them vexatious and time-consuming for adjustment and re-adjustment. For the past year or more in the Fracture Clinic of the Montreal General Hospital the device illustrated here has given satisfaction.



An ordinary white cotton stocking, somewhat oversize for the patient's foot, is pulled on so that the heel of stocking accurately fits the heel of foot. The redundant leg of the stocking is rolled loosely and acts as a buffer against the lateral rods of a Thomas splint. The toe of the stocking is pulled taut away from the patient's toes, and a spreader (wooden tongue spatula) is placed in position, around which the light cord is attached which runs over the pulley to a counterpoise.

There are no cramping of the toes, no pressure sores on heel, no excoriation from adhesive tape, and no slipping.

A SYMPTOM OF POISONING BY HYPNOTICS OF THE BARBITURIC ACID GROUP

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Poisoning by members of this group is now so common that it has become the subject of frequent comment, not only in the medical journals, but in the lay press also. While the ordinary symptoms are well known, there is one symptom which has never been stressed in publications on the subject, but which may nevertheless explain some of the acute and even fatal cases of poisoning which otherwise appear unaccountable. This symptom is perhaps most easily described by reference to the following three cases.

1. A professional man, aged 42, was taking dial tablets (each 1½ grains) for insomnia. He took one tablet and, failing to fall asleep, took a second. From that time he lost all knowledge of what he was doing, and apparently went on taking further tablets at intervals until he had emptied a complete tube of ten. He slept for thirty-six hours, and on waking had no recollection of taking more than two of the tablets.

2. A nurse, aged 35, had a precisely similar experience, also with dial, in her case emptying a tube in which were eight tablets, again without any recollection of having taken more than two.

3. Another professional man, aged 76, who was in the habit of taking veronal (7½ grain tablets) swallowed in a similar way eight of these tablets, and after sleeping for twenty-four hours assured me he had had only two, at intervals of one hour between the doses.

For this symptom I have borrowed the term "automatism", as that seems to explain best the process involved. It would appear that the knowledge of the need for another tablet persists, while the memory is so affected by the drug that the patient does not realize that he has already satisfied the need, and automatically repeats the dose at intervals. Though all three patients recovered, it has to be noted that in each instance the available supply was exhausted, and had a larger quantity of the drug been at hand there is no reason to believe it would not have been all taken, with possibly fatal result.

The occurrence of such a symptom adds materially to the risk of exceeding moderate doses in the use of drugs of this class.—*Brit. M. J.*, 1934, **1**: 331.

Editorial

NEW LIGHT ON HODGKIN'S DISEASE

HODGKIN'S disease, so called from Thomas Hodgkin, of Guy's Hospital, who described, in 1832,[1] a peculiar syndrome characterized by the enlargement of the lymph nodes and spleen, has proved to be a pathological puzzle. As time went on and since the affection has been studied by modern methods it has become evident that the cases described by Hodgkin were not all of the same nature and that even now differing conditions are grouped together under the same caption. The term, Hodgkin's disease, is, therefore, an unsatisfactory one and the recognition of this fact has led to the widespread adoption of the name "lymphadenoma" instead. It may be doubted, however, whether this latter is any improvement, for again we find included under it a number of conditions of the lymph nodes that bear a general resemblance to one another but differ in important particulars. We have in mind here pseudo-leukæmia, benign lymphoma, malignant lymphoma, lymphosarcoma, myeloma, plasmoma, Ebstein's disease, Mikulicz' disease, and mycosis fungoides. The subject is still further confused by the fact that cases have been reported which at first had all the hall-marks of Hodgkin's disease or lymphadenoma, but which developed eventually into leukæmia. How these various conditions are related, or, indeed, whether they are related at all, we cannot know until something more definite has been learned about their etiology.

At the present time there are two main views as to the nature of Hodgkin's disease. The first is that it is a malignant neoplasia; the second, that it is a peculiar form of inflammation, a granulomatosis, presumably due to a microorganism or a toxin. The facts that Hodgkin's disease may, on occasion, manifest invasive and destructive qualities, that it may produce what appear to be metastases, that it may assume the aspect of a pure lymphoid hyperplasia (lymphosarcoma), and, finally, that it is invariably fatal, all are adduced to support the theory that it is a malignant growth. Some of the earlier investigators believed this, and some later ones, notably, Warthin[2] and Medlar,[3] the latter of whom suggested that the neoplastic growth originated in the bone marrow. On the other hand, in most cases, the histological picture in the lymph nodes is unlike that of a malignant tumour, but is, rather, that of a progressive, even if special and unusual, form of inflammation (granulomatosis). There is a preliminary stage of lymphoid hyperplasia, followed by the appearance of pleomorphic cells—eosinophiles and Dorothy Reed cells—which gradually gives way to a notable hyperplasia of the reticulo-endothelial cells, and this last, in turn, to partial substitution by fibrosis. If we accept this conception and expand it to include the reticulo-endothelial system generally, the proliferative process being dependent on the action of some microbe or toxin, we can offer a reasonable explanation of the apparent occurrence of local invasion and the formation of what resemble metastatic deposits in the spleen, liver and elsewhere.

The two views mentioned above are, at first sight, strikingly opposed to one another. Yet it is possible to find common ground, at least in so far as the exceptional cases are concerned. We know already that prolonged irritation, whether from inflammation or other cause, is competent to set up a malignant process in susceptible persons and certain of the lower animals. May it not be that in Hodgkin's disease, in the exceptional case, the inflammatory process confers upon one or other particular type of cell a momentum, a power to proliferate independently of the original stimulus? In other words, the inflammatory process gets out of hand, so to speak, and initiates a malignant transformation. According to this view the etiological factor in Hodgkin's disease, whatever it may be, may be regarded simply as one more to be added to the list of the numerous irritants that, as we already

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know, are competent to initiate cancer. If we accept this conception Hodgkin's disease will be regarded as essentially a form of inflammation *sui generis*, which, however, may, on occasion, assume the characters of malignancy. Clearly, it is peculiar, in that, in many instances at least, there is a plethora of eosinophile cells in the lesions, and, rarely, in the blood, a fact which in itself suggests the operation of a special virus or toxic agent, and in that, unlike the common infective granulomata, it never retrogresses, but marches steadily onward to a fatal termination.

The search for some microorganismal cause for this inflammation has been intensive and prolonged, and the studies, it must be admitted, do not always carry conviction. The results obtained have often been conflicting, partly owing to the difficulties inherent in the subject, and partly from too limited material and the failure to control the work properly. Sternberg[4], one of the earliest investigators, thought that Hodgkin's disease was due to a special, perhaps attenuated, form of the tubercle bacillus, though in his later papers he admitted the possibility that some cases might not be tuberculous. It seems hard to admit the thesis that an inflammation due to an attenuated form of the tubercle bacillus could produce lesions so unlike those commonly produced by this microorganism and one, moreover, that is inevitably fatal. At the same time competent observers remark on the frequent association of tuberculosis and Hodgkin's disease in the same individual[5,6]. Even so, it does not necessarily follow that the former is the cause of the latter. The association may be merely fortuitous, or, at best, the Hodgkin's gland may simply provide a friendly nidus for the growth of the tubercle bacillus. We ourselves have seen more than once a lymph node showing tuberculosis and carcinoma side by side, but it would not be justifiable to assume from this that cancer is due to the tubercle bacillus. A fair number of observers have reported finding the tubercle bacillus in Hodgkin's glands—human, bovine and avian—but they do not all claim that it is the specific cause of the disease. Price[7], in Canada, and Van Rooyen[8], in England, for example, could not find any causal relationship between the avian type of bacillus and the Hodgkin's process. Fraenkel and Much[9] found Gram-positive, non-acid-fast, granules or rodlets which possibly may be an atypical form of *Corynebacterium tuberculosis*. Recent work of Sergent and others of the French school suggests that the tuberculosis organism can exist in several forms, a filterable virus, a granular form, a non-acid-fast bacillus, and an acid-fast bacillus. Study of the etiology of Hodgkin's disease should be reconsidered in the light of these researches. Negri and Mieremet,[10] and, independently, Bunting and Yates[11] have isolated diphtheroid bacilli in the glands of Hodgkin's disease, and this work has been confirmed by several others. Diphtheroid bacilli are rather ubiquitous, however, and their etiological connection has never been satisfactorily established. Pick[12] reports finding the lesions of Hodgkin's disease in a prolonged case of staphylococcus infection. MacGinnis[13] found spirochætes in the cervical nodes in Hodgkin's disease. Besides these varied forms of microorganisms, streptothrices and oidia have been met with. It should be added that agglutination and complement fixation tests, using various organisms obtained from Hodgkin's glands, have been practically negative.

The various infection theories as to causation have been subjected to an exhaustive examination by the workers of the Rose Research on Lymphadenoma,[14] who came to the conclusion that neither yeasts, acid-fast bacilli, diphtheroids, nor spirochætes are responsible for producing the condition. The virus theory, however, has recently received much further confirmation through the striking studies of Dr. M. H. Gordon,[15] one of the leading members of the Research. His work, which is a continuation of that of

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the research group mentioned, may be summarized briefly as follows.

Gland material from cases of Hodgkin's disease is pulped, diluted with ordinary broth to make a ten per cent suspension, and 1 cubic centimetre of this, which should be bacteria-free, is then injected, 0.4 c.c., into the brain of a rabbit, and 0.6 c.c. into a marginal vein of the ear. Rabbits so injected, after an incubation period of two to six days, manifest signs indicative of meningo-encephalitis—retraction of the head, pareses and convulsions. The clinical picture is peculiar and characteristic, and takes the form of muscular rigidity combined with ataxia and spastic paralysis. The condition is frequently fatal in a period varying from three days to a month or more, but usually in ten days. A large proportion of these rabbits, however, recover, and are then found to be immune to a second dose administered in the same way, material which was found to be active for control animals.

In the case of animals dying within a few days after the injection of very active material, on histological examination, definite lymphocytic meningitis was found to be present and a proportion of the blood vessels of the cerebral cortex were seen to be surrounded by a cuff of lymphocytes. Clinically, the manifestations are similar to those excited by the viruses of dermo-vaccine, herpes and psittacosis when injected intracerebrally in the same way. There seems to be, therefore, little doubt, both on clinical and histological grounds, that there is some pathogenic agent in the glands of lymphadenoma which is competent to give rise to meningo-encephalitis in the rabbit. In order to control these observations glands removed from patients suffering from other conditions, such as hyperplastic and chronic adenitis, leukæmia, sarcoma and lymphosarcoma, carcinoma, tuberculosis, mycosis fungoides, allergy, and from normal persons were treated in the same way and injected into rabbits. In no case was there any obvious effect.

Dr. Gordon concludes that the pathogenic agent in question is limited to lymphadenoma and specific for that disease. Further, the experiment, as detailed, can be used as a diagnostic test for the existence of lymphadenoma in any given case. This latter conclusion is concurred in by Van Rooyen, who has extended Gordon's observations[16]. In the light of the researches up to date Gordon has little doubt that the pathogenic agent in Hodgkin's disease is a specific microorganism belonging to the virus group. It would appear to belong to the same category as the heat-resisting viruses of trench fever and hog cholera or swine fever. The final proof, of course, must rest on further work whereby its filterability may be established, its multiplication in artificial culture, and also its passage in series through animals be effected, or otherwise. At the present, it is uncertain whether the pathogenic agent unearthed is a specific toxin or a living virus; it may be either. We cannot doubt, however, that these researches of Dr. Gordon and his co-workers have opened up a new and promising avenue of approach to an obscure and baffling problem.

A.G.N.

16. VAN ROOYEN, C. E., A Biological Test in the Diagnosis of Hodgkin's Disease, *Brit. M. J.*, 1933, **1**: 644.

THE FISH TAPEWORM IN EASTERN CANADA

AN article in this issue of the *Journal*, by Prof. H. B. Cushing and Dr. H. L. Bacal, of Montreal, entitled, "The increasing Prevalence in Eastern Canada of the Fish Tapeworm", calls attention to a subject about which most of us have thought little, but which is clearly of growing importance to the community.

The fish tapeworm, *Diphyllobothrium latum*, was introduced into North America during last century by immigrants from Finland and Russia and by now has established itself as a common denizen of the fresh-water fish of Michigan, Minnesota and Manitoba. Some five years ago, Dr. Daniel Nicholson,[1] of Winnipeg, in an excellent study of this subject, directed attention to the prevalence of this form of infestation in Manitoba. According to Birkeland,[2] more than 250 cases of infestation of human beings

1. NICHOLSON, D., *Canad. Med. Ass. J.*, 1928, **19**: 25.
2. BIRKELAND, I. W., *Medicine*, 1932, **11**: 2.

have been reported in North America since Walker[3] and Leidy[4] announced, in 1879, the first case noted in an American. According to Birkeland, also, the frequency of this form of infestation is increasing and the fish tapeworm is now the commonest of the cestodes found in central United States and central Canada. So far as Canada is concerned, we have been under the impression that the fish tapeworm was confined to the area mentioned, but Doctors Cushing and Bacal have now brought forward evidence to show that this parasite has extended its field of operation eastward. At the present time *Diphyllobothrium latum* is the variety of tapeworm most frequently met with in Montreal. Apparently, its prevalence is to be explained by the fact that at certain seasons the supply of fish on the local market is supplemented by importations from Manitoba. Here is a finger-post pointing to danger. It is worthy of note at this point that the first case of infestation in a native of the country, discovered in America, occurred in a French-Canadian who had never been outside of Canada and but rarely outside of the Province of Quebec. This case was reported by Dr. W. F. Hamilton, of Montreal[5].

Our authors, as do others, attribute infestation with the parasite to the practice of tasting or eating raw fish. The condition is commonest among women, and, particularly, among those of the Jewish race. These prepare a sort of fish cake, the seasoning of which they test before cooking by the simple expedient of tasting. Also they prepare a *hors d'œuvre* of chopped raw fish on toast which is even more likely to be a source of danger. Doctors Cushing and Bacal report finding forty cases of infestation with the fish tapeworm in Montreal, twelve of which were indigenous. This is somewhat disquieting. They are, further, of the opinion that this form of parasitism is becoming so common in eastern Canada as to call for special measures of control. The matter has been brought to the attention of the public health authorities, and it is to be hoped that efficient action will be taken in the matter. The public, also, should be informed as to the danger of eating raw fish, and stricter supervision of the supplies of fresh-water fish in our markets is in order.

It has, of course, been known for years that the clinical and hæmatological picture of pernicious anæmia sometimes occurs in connection with infestation with the fish tapeworm. It was beside the purpose of our authors to go into this subject, and, accordingly, the data they submit with regard to the state of the blood in their cases are incomplete. They say that anæmia was not the rule in their observations, but when anæmia did occur it was severe. They also comment on the fact that when the cause was removed the blood condition speedily improved. They give brief case histories of seven patients who exhibited marked anæmia. Three of these, with considerable probability, may be classed as of the pernicious type. In six of their forty cases we note that the colour-index was above one, but in four of these the other features of the blood are not recorded. One case (No. 5) was fairly typical of pernicious anæmia, save that the colour-index was only 0.96. The history here, however, showed that the patient had been afflicted with tapeworm for at least ten years, and in 1928 a blood examination gave a colour-index of 1.04. Probably this should be accepted as a true case of pernicious anæmia.

Schauman[6], who made a life study of the subject, in 1894, having regard to the facilities available at that time, seems to have proved conclusively that the anæmia found in cases of infestation with Diphyllobothrium does not differ essentially from that form usually described as "cryptogenic", "idiopathic", "essential" or "Addisonian" pernicious anæmia. However, he emphasized that parasitism alone could not be blamed for the development of the anæmia. He assumed the existence of predisposing factors, such as sex, age, life, occupation, physique, previous health and heredity. His views have not been universally accepted, however. Among those who differed have been Rosenow[7] and, on this continent, Edsall[8] and

3. WALKER, J. T., *Philadelphia Med. Times*, 1879, **9**: 326
4. LEIDY, *Proc. Acad. Nat. Sc.*, 1879, **31**: 40.
5. HAMILTON, W. F., *Montreal, Med. J.*, 1901, **30**: 350.
6. SCHAUMAN, O., Zur Kenntnis der sogenannten Bothriocephalus-Anæmie, Akademische Abhandlung. Weilin and Göös, Helsingfors, 1894.
7. ROSENOW, G., *Zeitschr. f. klin. Med.*, 1927, **106**: 212.
8. EDSALL, D. L., *Amer. Med.*, 1904, **8**: 1087.

Warthin[9]. On the other hand, an imposing array of observers, such as Lazarus, Grawitz, Naegeli, Pappenheim and Willson, support the conclusions of Schauman and his pupils. In 1925 an article by Schauman[10], completed by Saltzman owing to the death of the former before his work had been quite finished, emphasized again the identity of Diphyllobothrium anæmia with the cryptogenic form. Those who oppose Schauman base their position on certain deviations of the blood picture from the type considered usually to be pathognomonic of cryptogenic or essential (Addisonian) anæmia, such as the presence in some cases of leucocytosis without relative lymphocytosis and a minus colour-index; on the cryptogenic causative factor; and on the hopeless prognosis. The more recent work of Minot and Murphy on the curative action of liver and liver extracts in pernicious anæmia, and the observations of Castle and his co-workers on the gastric secretion would seem to have knocked the bottom out of these contentions. Even if the full story cannot yet be told about pernicious anæmia this disease can no longer be properly termed "cryptogenic" or "essential". It would seem logical, then, to admit that true, pernicious (Addisonian) anæmia may be due to several causes. We can no longer defend the thesis that the designation "true pernicious" or "Addisonian" anæmia should only be applied to a special or peculiar type of anæmia for which no cause can be demonstrated. So far as the fish tapeworm is concerned the truth seems to be that we may have all gradations in the condition of the blood of those infested, from normality (it is remarkable how often infestation may occur without any obvious disturbance of the health of the patient), through various grades of secondary anæmia, to a condition indistinguishable from the classical picture in pernicious anæmia. And, as Doctors Cushing and Bacal state, it is often impossible, on clinical, pathological, or hæmatological grounds, to make a positive diagnosis of pernicious anæmia in any given case. Perhaps we might put the matter this way. Every patient infested with the fish tapeworm is a potential candidate for pernicious anæmia.

A.G.N.

9. WARTHIN, A. S., *J. Am. M. Ass.*, 1928, **90**: 2080.
10. SCHAUMAN, O., and SALTZMAN, F., in Schittenhelm's Handbuch der Krankheiten des Blutes und der blutbildenden Organe, Springer, Berlin, 1925, **2**: 100.

Editorial Comments

The Medical Faculty of Toronto in 1932-1933

The report of the Dean of the Medical Faculty of the University of Toronto for 1932-1933 lies before us and, as one would expect, is a record of notable progress. We note with pleasure the increase in the facilities for study and research which have been provided during the period covered. One of the most significant of the inter-departmental developments during the year was the organization of the University of Toronto Physiological Society. We, of the *Journal*, have been so fortunate as, from time to time, to receive research papers from the Department of Physiology of the University, and we can bear testimony to the high class of the work that emanates from that Department. Likewise, good material has reached us from the Banting Institute. All this is an indication of a vigorous life and an active and far-seeing personnel. The Dean remarks that at no time in the history of the Faculty has there been greater interest in productive scholarship than at present. This situation will be gratifying to scientific investigators not only in Toronto but throughout Canada.

Last year the *Journal* published a series of articles on Medical Education, considering that the subject was of such importance and widespread interest as to merit detailed consideration. Many of the difficulties met with are common to all medical schools and curricula, and Toronto is no exception. Doctor FitzGerald indicates that his Faculty is not satisfied with things as they are, either in respect of the length of the present course in medicine, the time available for instruction in the various subjects, the coordination in teaching, or even the content of all courses. While all this is not new, it is satisfactory to learn that the Toronto Faculty is giving serious and sustained attention to the solution of the problems. Conferences between the Medical Schools of the various Canadian universities would seem to be in order, so that some uniformity of action may be agreed upon, if that be possible or desirable.

Doctor FitzGerald also calls attention to another matter of pressing importance. He remarks on the absolute lack of any plan, in this or other countries, to adjust supply of and demand for medical graduates. He asks: "Why

should universities in this province continue, at great expense, to train more physicians than are currently needed.'' Why, indeed? Yet the medical schools of the whole world, apparently, are doing the same thing. No doubt, the reason for the overplus of medical students is, to some extent, to be found in the present existing economic situation; young men and women, having nothing else to do at the time, have turned towards the universities and towards specialized instruction. But the same is true of other fields. Law, science, economics, all show the same situation. Medicine, of all studies, requires a relatively high preliminary standard of scholarship; the course is lengthy and expensive; the study is exacting, both on mind and body; and the dubious prospect of making a reasonably decent living, what with the encroachments of hospitals, clinics, and municipalities on the domain of the private physician, the increased competition, and the uncertain future, all conspire to make the career of medicine unattractive at the moment. Or, so one would think. The practice of medicine is distinctly a rich man's hobby. Under the circumstances it is a matter for wonder why so many of our young people enter so lightheartedly on the career of medicine. As Doctor FitzGerald remarks, the situation calls for careful, thorough and coordinated investigation, here as elsewhere. A.G.N.

The Advertising to the Public of Dangerous Toilet Preparations

We have had occasion to discuss editorially in a recent issue of the *Journal*[1] the important subject of the ethics of advertising and have called attention to certain types of proprietary preparations, chiefly intended for toilet use, which have been proved to be dangerous to health and life. A depilatory paste, known as ''Koremlu'', which contained thallium, was one of these. Our neighbours to the south of us are presently engaged in framing legislation designed to prevent the exploitation of the public through fraudulent advertising and the sale of dangerous proprietary preparations. Objectionable advertising is not unknown in Canada, certainly, but it has not, so far, reached the same proportions as in the United States. But we ventured to express the opinion that, with the tightening of the restrictions in the latter country, we might find an increase in the amount of objectionable advertising relating to cosmetics and toilet articles in our Canadian journals. This prediction is apparently in process of fulfilment.

1. *Canad. M. Ass. J.*, 1934, **30**: 186, 188.

We give here an advertisement taken from the Montreal *Daily Star* of March 3, 1934. The reprehensible character of this advertisement will be apparent to all medical men.

The sentiment beginning ''This beautifying cream and powder. . . .'' *et seq.* is gracefully expressed, but we must confess that to us, at least, the meaning is somewhat obscure. It is apparently a translation of some prospectus in a foreign language, by one who is not entirely familiar with English, and the name of the agents sponsoring the preparation has a foreign ring about it, too. The formula is given with engaging frankness; the beautifying cream and powder contain thorium chloride and radium bromide. Now, we do not as yet know much about the first of these substances. Thorium is used to show up certain organs of the body under the x-rays; whether it is harmful to the body or not remains to be seen, and, more specifically, whether it is safe when applied to the skin also remains to be seen. It might be well to wait until we know more about it before selling it to the public. When we come to the radium constituent we are on solid ground. Radium is a powerful agent which should not be in the hands of any not specially expert in its use. Death has occurred, in a horrible form, from the use of a radio-active water, and serious illness and death have occurred among operatives employed in painting the dials of watches with radium-containing paint. We submit that a toilet cream containing radium, which, presumably, would be used for a more or less prolonged period is not exactly the kind of thing that should be applied to the faces of an unsuspecting public. If the preparation in question does not contain thorium and radium it is a deception; if it does contain radium it is dangerous. We further ask

Introducing
THO-RADIA
BEAUTIFYING
CREAM
and
POWDER
This beautifying cream, and powder containing these two precious elements, Radium and Thorium, whose radio activity is thereby officially guaranteed through the evanescent gifts of nature.

THO-RADIA CREAM
Compounded with THORIUM and RADIUM according to Dr. Alfred Curie's formula.

FORMULA
Thorium Chloride 0.50 gr.
Radium Bromure, 0.25 microg.
Excepient Q.S.P. 100 gram.

Is on Sale at
CAPE'S DRUG STORES,
AMERICAN DRUG STORES
DUPUIS FRERES
Agents: Komol & Co., Castle Bldg. MA. 5032

what useful purpose radium in a "beautifying" cream could subserve. Any newspaper or magazine that advertises preparations containing radium for use by the general public is assuming a grave moral responsibility. A.G.N.

Mr. Punch Among the Doctors*

There are a certain number of stock jokes against doctors, as there are against any other profession. Mr. Punch, whose pleasant policy it has always been (though difficult enough at times) to look steadily on the lighter side of life, has assembled in this volume all that he himself has seen of us from this point of view. The book is of some historical significance, as it goes back to Mr. Punch's childhood days, if such a term can be applied to a stage which he has preserved so happily even until now. One of the first things one notices is that, except for clothes and motors, things have not altered very much in the externals of the medical world. Sixty-five years ago one finds patients criticizing their medical bills; a fat old cook, for example is shown holding out her bill and indignantly remarking to her kitchen staff—"Medical attendance two and sixpence. Well, that's a good 'un. Why, I attended on 'im! An' 'ad to wait two hours in that there surgery." And the doctor still had his methods of creating an impression: witness the struggling young medico who, after listening with rapt attention to the symptoms of his first patient rings the bell and tells his servant in a loud voice "When the Prime Minister arrives show him into the waiting room and ask him to be good enough to wait a while."

Nor was the patient always ready to accept explanations. There is the picture of the old Scotch grannie saying: "And wit's the matter wi' me right leg, Doctor?" "Oh, just old age, Mrs. MacDougall." "Hoots, mon; ye're haverin'! The left leg's hale and soond, and they're *baith* the same age." And what was the poor doctor to say when a shepherd meets him on the road and in concluding his tale of a late bereavement winds up with: "Sae A gied her some o' that wee bottle that ye left yest're'een, an' she just slippit awa' at fower o'clock the morn." Doctor: "Dear, Dear! I'm very sorry to hear that." Shepherd (thoughtfully): "Eh, mon, Doctor, isna it a mairey A didna tak' any o' the wee bottle masel'!

The patient who always has something to say about his prescription is shown in the case of the stout gentleman who is being told by his doctor, "And don't smoke on an empty stomach." To which comes the disconcerting reply: "That's all right, doctor, I never have one."

But Mr. Punch has seen pathos too. In his last picture, he shows a hospital ward, with a little girl—'one of a large family, in a poor district'—asking the nurse, as a glass of milk is handed to her: "How far down can I drink?"

The drawings must be seen to fully appreciate the good things of the book: the scene, for instance, of the doctor saying to the lady recovering from a sprained wrist: "Well, now, how much can you do with it?" Lady: "I can just raise arf-a-pint to me lips, doctor, if I stoops me 'ead.": or the competition night at the Pharmaceutical Society for deciphering prescriptions of eminent medical men. But in none of them has the artist risen to greater heights than in the cover-page design, wherein appears Mr. Punch in bed, with two dignified but puzzled-looking elderly medical men gazing down at him. Mr. Punch may be no doctor, but there is that in his face which shows how very well he knows that they are puzzled about him, and he is enjoying it to the very last twinkle of his mischievous little eyes. H.E.M.

*Mr. Punch Among the Doctors. Second edition, 104 pp., price $1.50. Methuen & Co., London, 1934.

The Archives of Pædiatrics

We have before us the semi-centennial number of the well and favourably known *Archives of Pædiatrics*, which made its initial bow to the profession on January 15, 1884. It was in point of time the first journal devoted exclusively to the subject of disease in children. From the Editor's Note, of Dr. William Perry Watson, we learn that the object of the new periodical was "to present each month, in Original Communications, Clinical Lectures, Clinical Memoranda, and Transactions of Societies, the latest opinions of our prominent writers and teachers, together with a brief practical résumé of all the current pædiatric literature of the world." This ambition the *Archives* has consistently lived up to and its course since 1884 has been one of continuous success. Indeed, a glance at the list of collaborators which appeared on the title-page of that first number—for America, Keating, Forcheimer, Hatfield, Ingraham, Oliver, Borck, Plant, and Walker; for Canada, Blackader; for Great Britain, Goodhart, Finlayson and Ashby—reveals the reason why the infant periodical was soon "going strong." Our own Blackader was the first in Canada to establish a clinic for children, which he did privately in 1880, and later in the Montreal General Hospital, and was one of the first anywhere to recognize that the subject of pædiatrics was worthy to be regarded as a specialty. It was a foregone conclusion that he would be interested in the establishment of a journal devoted exclusively to the consideration of diseases of children. The other collaborators were also men of force. Among others of note who contributed to the pages of the *Archives* were Abraham Jacobi and L. Emmett Holt. It would not be far wrong to say that the stimulus afforded by the establishment of

this special journal did much to establish pædiatrics on a firm footing of its own and helped to bring about the formation of the American Pædiatric Association in 1889.

The centennial number reproduces the title page and the matter of the first number of 1884. It republishes original communications by W. T. Plant, A. Jacobi, and J. Lewis Smith; clinical lectures by J. M. Keating, F. Forcheimer and Louis Starr; clinical memoranda by L. Emmett Holt, W. P. Northrup, and Henry Dwight Chapin; translations and abstracts. As one would expect, at that date, the contributions were entirely of a "clinical" nature. Later, as knowledge in regard to pædiatrics accumulated less dependence was placed on quotations from the literature and more on original clinical observations. It has been the steady policy of the *Archives* during the fifty years of its existence to maintain this "clinical" character, so as to be of "practical" use not only to the specialist in pædiatrics but to the general practitioner as well. The present editors are Drs. H. R. Mixsell and J. F. Landon.

We extend to our contemporary our congratulations on its success, and express our hope and expectation that *The Archives of Pædiatrics* will continue to occupy a high place in the esteem of our profession. A.G.N.

Special Articles

INVOLUNTARY MOVEMENTS*

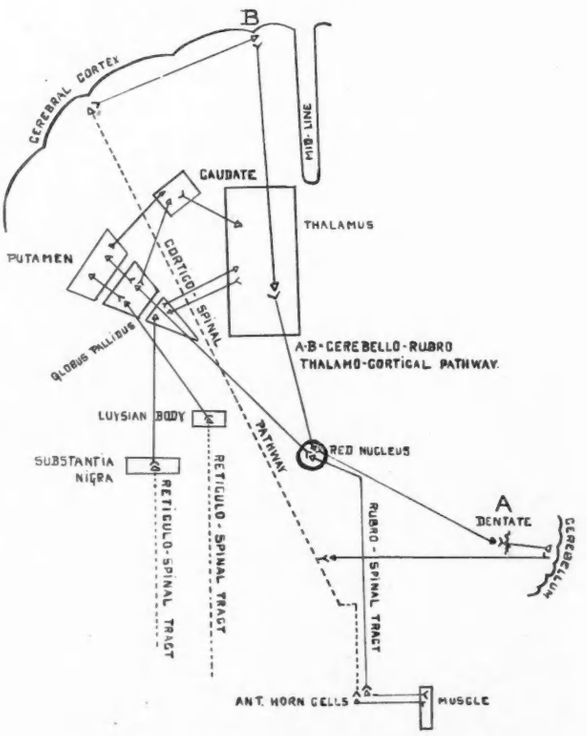
BY ARTHUR W. YOUNG, M.D., C.M., F.R.C.P.(C.),

Montreal

The pathogenesis of the involuntary movements, chorea, athetosis and tremor is indeed a live subject, if the literature is any criterion of the controversial views. Very speculative and not in the least dogmatic are the views, but most conclude that some disease of the basal ganglia or their connections is necessary. An explanation of these movements will be attempted, which, however, will not include any new ideas or conceptions, but will correlate and simplify opinions.

The basal ganglia and their fibre-connections, namely the extra-pyramidal system, are made up of the corpus striatum, thalamus, luysian body, red nucleus and several subthalamic nuclei (Fig. 1). The corpus striatum in man is divided by the passage of the internal capsule into two structures—the caudate and lenticular nuclei. The lenticular nucleus is further sub-divided into an external segment, the putamen, and an internal segment, the globus pallidus. Histologically, the putamen and caudate nucleus (the striatum) are identical in origin and structure, and contain small ganglion cells and giant cells. Their axis-cylinders terminate in the globus pallidus. The globus pallidus (the pallidum) contains large ganglion cells from which long axis-cylinders take origin and run via the ansa lenticularis to the thalamus and other subthalamic nuclei. The corpus striatum is a motor centre and by reason of its connection with other basal ganglia nuclei is supposed to have the all important controlling force over them. It is well known that it has no direct connection with the cerebral cortex.

The luysian body is intimately linked with the corpus striatum, and with other sub-thalamic nuclei. Descending fibres leaving this body can



only be traced down a few millimetres. The red nucleus has important connections with the cerebellum, thalamus and cerebral cortex. It also links the basal ganglia with the skeletal musculature, via the rubrospinal tract. The thalamus, divisible into several cellular masses, is the great sensory station. It is intimately linked with all the basal ganglia, and it is via

* From the Department of Neurology of McGill University, Royal Victoria Hospital and Children's Memorial Hospital, Montreal.

this nuclear mass that they have important cortical connections. It is said to have a controlling force over the emotions.

The full function of the ganglia is extremely obscure. At one stage in the development of the vertebrates the corpus striatum and thalamus functioned as a brain in miniature, the latter having a sensory function and the former a correlating centre for translating sensory into motor patterns. In the ascension of the vertebrate series the pallium or cortex assumed a higher function, till in man these ganglia account for a very small part of the brain bulk and their importance has receded. Knowing this, animal experimentation becomes of little value, because in animals these ganglia play a more important rôle than in man. Again, in dealing with animals of a higher series, such as the cat and the ape, experimentation becomes a very difficult feat. Briefly, it may be said that experimental work on these ganglia has thrown little light on their function. Wilson stimulated the lenticular nucleus in monkeys, but found it unexcitable. Destructive lesions produced negative results, with the exception of slight awkwardness and increased reflexes in the opposite limbs if the lesions were large. Edwards produced a destructive lesion of the corpus striatum in dogs, with a comparatively slight degree of alteration in their general behaviour. Fine tremors and clumsiness of movements did occur in some, which, however, lasted only four weeks. Other experiments could be cited, giving similar negative results. On the other hand, positive findings such as paralysis, hypertonicity, difficulty in swallowing, restlessness, athetosis and tremor could be given.

If conclusions are justified from a review of experimentation on the basal ganglia, their rôle is a silent one, for in destruction and irritation lesions the results are practically nil. At least it may be said that the negative results far outweigh the positive ones.

The clinical approach to the involuntary movements throws more light on their pathophysiology than any other.

Chorea.—Chorea, characterized by movements which have long been shrouded in mystery by the term "involuntary" or "automatic" movements, is in reality purposeless to the bystander, yet may be purposeful to the subject. These movements are frequently of delicate pattern, fine, discreet, playful, theatrical, torturing, harassing, gesticulating and dramatic. The rapid, fiery, irregular pattern, with each succeeding movement differing from the preceding one, identifies them. The movements are explosive, separate, abrupt, and poorly sustained. The physiological explanation of these movements from the study of Sydenham's, the chorea of youth, and Huntington's, the chorea of middle and advanced age, has given very little help, because in the former the pathological changes are scanty, and in the latter the lesions are very diffuse.

Athetosis.—Athetoid movements are of a slow confluent character, extremely elaborate and changeable, each succeeding movement differing from the preceding one, and especially prominent when a voluntary movement is made. The pathogeneses of chorea and athetosis are discussed together because they have certain common characteristics and really belong to the same group. In 14 deaths from chorea, reported by Hughes (1868) the brain was quite healthy in 4 cases, congested only in 3, and in the remaining 7 a variable picture was seen, such as serous effusion beneath the arachnoid, blood effusion into the meninges, thickened and adherent dura, congested and softened brain. In one case the left thalamus was rather soft. No conclusions as to the site of the lesion could be drawn from his observations.

Reynolds (1868) infers that irritation preceding inflammation is the all-important cause, and thus he accounts for the absence of inflammatory reaction in the brain. He also believes that if inflammatory reactions do occur they are probably ushered in shortly before death and have nothing to do with the true choreic symptoms.

Osler (1894), writing on chorea, mentions that Turner (1890) studied the brain in 19 cases and in 16 there was intense cerebral hyperæmia, periarterial exudation, erosion and minute hæmorrhages, and occasionally emboli. These changes were most marked in the deeper parts of the motor tract and particularly in the lenticular nuclei and the thalami. In one of Osler's cases, there was a soft embolic softening, the size of a cherry, in the right lenticluar nucleus. In summarizing the pathological picture, he remarks on the degeneration, swelling, and turbidity of the large pyramidal cells in the Rolandic area. Wana also found hyaline degeneration of these pyramidal cells.

Gowers (1888), because of the derangement of movement in chorea, assumes that it must be due to disordered action of the cells of the motor cortex, either primary or secondary. At one time it was thought that the corpus striatum was primarily at fault, for it was held that movements were collected in the basal ganglia after the impulses left the motor cortex. Thinking this to be impossible, Gowers saw the likelihood of the thalamus, with its diffuse cortical connection, being at fault, and found evidence to suggest this because of the association of disease of the thalamus with choreoid movements. However, he made a distinction between choreoid movements and true chorea, and once more was forced to believe that the seat of the trouble did not lie outside the cortex but in the cortex itself. He argued that in chorea one often found a mental change, and remarked that chorea had been called insanity of the muscles,

and a mania might be called chorea of the mind. Again, the march of the choreic movements has been likened to the discharge in epilepsy, where the over-action of a group of cells stimulates the over-action of adjacent groups, and spreads from one side of the cortex to the other.

The study of chorea resulting from definite structural changes, as seen in localized hæmorrhages, tumours, and inflammatory lesions in the brain, has given much to our understanding of the problem. To cite:—

Mrs. J.B., aged 45, was admitted to the Royal Victoria Hospital on February 14, 1928, because of constant twitching of the right arm and mental confusion. This twitching spread to the right leg; her speech was accompanied by facial contortions; and her arm was continually in motion, the movements being irregular in pattern and typically choreic. She died on the 10th day of her admission from bronchopneumonia and cardiac failure. On examination, there was a small recent localized hæmorrhage in the left luysian body.

This case is in agreement with those described by Martin (1927), who collected 15 cases from the literature and his own personal observations, and concluded that the luysian body was affected in 12, and the remaining 3 must have had some interruption of the descending fibres of the luysian body because of the location of the lesions.

Weil (1928) collected 6 cases, including his own and one previously reported by Martin, and recognized lesions in the anterior cerebellar peduncle, in the thalamus, in the corpus striatum and in the luysian body. Whereas Martin is rather prone to the specific opinion that interruption of the descending fibres of the luysian body is responsible in some way for the occurrence of chorea, Weil puts it on a broader basis, claiming that lesions of the corpus striatum, the thalamus or the luysian body are responsible for it. One might cite numerous authorities on this subject, most of whom give diverse opinions. Anton (1895) showed the importance of the corpus striatum in the production of choreo-athetoic movements. Marie and Lhermitte (1917) held that the cause of choreic movements must be sought in the corpus striatum because of the constant atrophic degenerative changes there. Jakob (1925) regarded chorea as striatal in origin and athetosis as pallidal. However, he stated specifically that lesions in the mid-brain and brain-stem may produce the same clinical syndrome, because the striatum and pallidum do not act independently. The mid-brain region receives a dual influence, according to him, via the basal ganglia and the cerebellum, and any disruption of the co-ordinating mechanism in this vicinity or along these pathways produces the movements.

The bulk of evidence points to a defect of the basal ganglia or their connections and the problem now resolves itself into how are these movements exteriorised? Are they dependent on an upset of the extra-pyramidal system, and exteriorised *via* it, or are they responsible to disease of the extra-pyramidal system and exteriorised *via* the cortico-spinal system?

It has been suggested in the past that lesions of the basal ganglia in close proximity to the cortico-spinal fibres irritate these fibres and cause choreo-athetoid movements. Jacob suggests that the movements are exteriorised *via* the rubro-spinal or the pallido-rubro-olivary or pallido-rubro-reticular pathways. Martin is insistent on a luysian body affection or an interruption of some descending pathway as the responsible agents. Thomas (1932) observed that athetoid movements occurred in parts of a limb deprived of cortico-spinal tract connections, and presented a pathological study to confirm this statement. Wilson (1925) has advanced the most satisfactory physiological conception. By means of clinical analysis and kymographic tracings of these movements, he has been able to show that the cortico-spinal system functions in an abnormal manner in chorea, although he states further that the abnormal state need not be a structural defect or have its origin in the motor or effector side. He remarks that frequently the choreic limb is weak, and makes the all important observation that these movements never occur in a totally paralysed limb. He maintains that there must be a relative integrity of the cortico-spinal pathway. The limbs in chorea are often hypotonic and the pendular reflex is often present, which suggests a cerebellar disturbance. Analysis of this nature allows Wilson to deduce that the cerebellum and cerebral cortex play a rôle in the production of these movements, and he concludes that the lesion producing them must lie somewhere along the cerebello-mesencephalo-thalamo-cortical pathway (Fig. 1 A-B) and the movements must be exteriorised *via* the cortico-spinal pathway.

Dystonia musculorum deformans or *torsion spasm.*—Torsion spasm is characterized by grotesque twitching and irregular movements of the body—a mixture of choreo-athetoid and tic-like movements. The entire body seems to be in constant turmoil, wriggling, and changing shape and form. The pathogenesis of this disorder requires further study. Only can it be said that it is a basal ganglion affair, the bulk of evidence pointing to a corpus striatum defect. It is extremely interesting to speculate on the relationship of the neurotic tics and torsion spasm. Frequently, at the outset, it is difficult to differentiate one from the other. Sometimes torsion spasm consists of a twitching movement of one segment of the body, yet as the condition develops the whole body is affected, whereas in tics these seldom if ever spread from the original site.

Tremor.—Tremor may have, on the one hand, an organic basis, either basal ganglionic or cerebellar, or, on the other, a functional or non-

organic basis. The fine tremor of exophthalmic goitre is supposedly due to hyperactivity of the autonomic nervous system, but actually the explanation is wanting, as also of the tremor of any intoxication, such as that of delirium tremens. The functional or neurotic tremors have unquestionably a psychogenic basis and not a structural one. To distinguish tremor of one origin from that of another is extremely difficult. Supposedly, the tremor of the basal ganglion type is present at rest, whereas the cerebellar type is present on movement. In the first instance, it is tremor at rest and in the latter, action or intention tremor. Not infrequently one type blends with the other, and in basal ganglionic disease both types are sometimes present, although tremor at rest, the typical "pill-rolling" tremor of paralysis agitans, is more constant.

According to the Vogts, the tremor of paralysis agitans is a symptom of the "syndrome of the striatum." Only part of the cells of the striatum are affected, "état de desintegration", which releases the pallidum and tremor is produced. Emotional stimuli or peripheral stimulation increase the tremor because of their influence on the pallidum. If rigidity features the disease, it is supposed that previous affection of the pallidum prevents the tremor. Rigor or rigidity is a pallidal symptom and is attributed to severe inhibition of pallidal function, whereas tremor is a striatal symptom. Hughlings Jackson considered tremor and rigidity as closely allied; he said rigidity was tremor "run together". Rigidity has been described as "tremor spread out thin." That tonus of a limb bears no part in the production of a tremor is evident because it occurs in hypertonic, tonic and hypotonic states. Tremor and hypertonus are characteristic of paralysis agitans; the tremor is most active when the limb is at rest, yet in some instances it is increased on movement or action. Tremor and hypotonus are characteristic of disease of the cerebellum or its pathways; the tremor may be of a static type, but is especially evident on movement or action — intention tremor. The tonic state of a limb is not responsible for the tremor.

Fulton produced in cats by removal of the cerebellum, a tremor when they attempted to move voluntarily (an intention or action tremor) and then extinguished this tremor by removal of both cerebral hemispheres. He hypothesizes for the cerebral cortex a compensatory function —that is, it can take up the function of the lost cerebellum. This compensatory function is incomplete in acute lesions of the cerebellum and tremor results, whereas in chronic or slow destructive cerebellar lesions it is complete and no tremor results. To substantiate this, he quotes a case of congenital lesion of the cerebellum which was symptomless until, at a later date, a lesion of the cerebral cortex produced cerebellar symptoms. It is his contention that the cerebral cortex was able to adapt itself to the cerebellar functions completely in that particular case. At any rate, he has clearly demonstrated in cats with lost cerebellum that tremors are present during voluntary movements involving postural activity, and this tremor can be abolished by removal of the cerebral hemispheres.

That tremor is not the result of cortical or spinal lesions is evident to all. That it does occur in lesions of the corpus striatum, the red nucleus and the cerebellum, would indicate that these non-volitional prespinal centres are responsible for its production, by releasing centres of a lower order whose activity expresses this rhythmical movement.

It is of extreme interest that tremor occurs in extreme emotional states such as a severe fright; that tremor occurs in occupational neuroses as seen in writer's cramp; that chorea can be imitated by a nervous child to resemble the true Sydenham type; that choreiform movements can occur, and be wrongly diagnosed as the Huntington type, and completely abolished by hypnotic suggestion; that tics of various types can be so gross and widespread as to resemble torsion spasm; yet in none of these instances is any actual structural defect present.

EARLY DIAGNOSIS OF WHOOPING-COUGH.—M. Dénes and L. Latos (*Orvosi Hetilap*, November 18, 1933, p. 1049) have examined the characteristic changes occurring in the blood of whooping-cough patients with a view to facilitating diagnosis in the earliest (catarrhal) stage—when transmission usually takes place, when therapy is likely to prove most effective, and when, consequently, an early diagnosis is of the greatest importance. Sixty-five patients between the ages of 10 weeks and 15 years were examined with the following results: the blood in whooping-cough shows a moderate lymphocytosis coupled with a decrease of the sedimentation rate, absolute in the case of infants and relative in the case of children of more advanced age. A suspicious cough may, it is stated, be safely diagnosed as pertussis if the number of lymphocytes exceeds 10,000 and the sedimentation rate is normal or subnormal. Complications accompanying whooping-cough cause a slight increase in the granulated elements and an increased sedimentation rate in the blood. The authors conclude that, in the initial stage of whooping-cough as well as in doubtful cases, the blood count and sedimentation test constitute a valuable aid towards a sure diagnosis.—*Brit. M. J.*, 1934, **2**: Ep. 44.

Medical Economics

THE NEW MEDICAL RELIEF PLAN IN WINNIPEG

BY E. S. MOORHEAD,

Chairman, Special Relief Committee,

Winnipeg

The premier of Manitoba declined to accept the offer made by the Prime Minister in December, 1933, with regard to medical care of those on relief. Further, in January, 1934, the Premier stated in the course of a letter to the Special Relief Committee that the care of the sick was a municipal responsibility. This announcement cleared the air very definitely.

Our position was explained very fully at a general meeting of the profession held on January 26, 1934. Until this time, no restrictions had been placed on doctors attending their former patients in the home or office, and the definition of emergency was so liberal that people really in need of medical care had no difficulty in gaining admission to the hospital. The meeting unanimously passed a motion to refuse all care in the house, office or hospital to those on relief, except in cases of emergency. The definition of emergency was amended as follows:

> "An emergency is one in which life is in imminent danger, and for which immediate action is required."

All the doctors present signed their assent to the motion.

The following day the press came out with headlines to the effect that the doctors had presented an ultimatum to the city. There was no accompanying criticism of the action of the doctors. On the contrary, the editorials condemned the authorities for refusing to face the issue and insisted that immediate action was necessary. A few days later, an invitation to a conference with the civic relief committee was extended to the doctors. A plan was submitted by the civic authorities, and after minor alterations was accepted in the form printed below.

1. A list of physicians who wish to participate in the Winnipeg medical relief scheme shall be prepared.

2. A copy of this list, with addresses, shall be kept available at the Relief Offices (Elgin Avenue and Women's Department).

3. Physicians registering as above set out shall sign an agreement to abide by the rules and regulations covering medical relief, the terms of which agreement shall first be agreed upon by the Winnipeg Medical Society and the Unemployment Relief Committee.

4. Notices shall also be posted advising persons on relief who require medical attention (including maternity cases) to arrange for same through the Relief Medical Officer, and to advise name of family physician (who is on the list), and Relief Medical Officer shall issue the necessary authority for medical attention.

5. Physicians, before answering call, will check for authorization from Relief Medical Officer, or assure himself the case is an emergency.

6. Only prescriptions in B.P. or similar formulæ will be used.

7. Physician will endorse on relief recipient's identification card the date of the call and the name of the patient, and will also sign his name after the entry.

8. The attending physician shall notify the Relief Office of his attendance within twenty-four (24) hours after having attended same.

9. The City shall provide a form for the physician's report, which, along with other data, shall call for an estimate of the attention likely to be required.

10. No further attendance shall be given without authority of the Relief Medical Officer, on whom shall rest the responsibility of notifying the physician regarding further attendance.

11. A filing system shall be maintained at the Relief Office (or other convenient place), on which shall be entered details of all medical attention to recipient and his dependents.

12. A Medical Referee shall be appointed in the person of the Relief Department physician and a Medical Advisory Board shall also be appointed, composed of the City Medical Health Officer or his representative, the Relief Department physician, and two doctors to be selected from a panel to be nominated by the Winnipeg Medical Society.

13. The duty of the Medical Referee shall be to decide as to the need for further attendance on the patient, and such other matters as may be referred to him.

14. The duty of the Medical Advisory Board shall be to advise the Unemployment Relief Committee (or its Chairman) on any matters which may arise in connection with medical relief and the working thereof.

15. Physicians' accounts shall be rendered monthly.

16. The following fees shall be charged by physicians attending relief recipients under these rules:

(a)	At office	$ 1.00
(b)	At home	1.50
(c)	At hospital	.75
(d)	Maternity cases, inclusive of pre-natal care and subsequent reasonable care, on the following basis:	
	At hospital	$10.00
	At home	20.00
(e)	A monthly maximum of $100.00 to be allowed any one physician, provided that his maximum may be increased in special cases on the advice of the Medical Advisory Board by the Unemployment Relief Committee.	

17. Operations, when approved by the Medical Advisory Board, shall be paid for at a rate provided for in the schedule agreed upon, and in the case of an operation not specifically listed in said schedule at a rate to be established by the Medical Advisory Board and approved by the Unemployment Relief Committee; no operation to exceed fifty dollars ($50.00), inclusive of reasonable subsequent care.

18. The Unemployment Relief Committee may take full advantage of the services of the City's Health Department and its present associate physicians, and of the Relief Department's own physician.

19. The medical profession shall, by means of a committee or otherwise, give every assistance to the Unemployment Relief Committee in preventing and arresting abuses and in promoting the smooth working of this agreement.

20. That any case of abuse of this or any substitute plan for medical relief to the unemployed by the medical profession, may be reported to the Manitoba College of Physicians and Surgeons for necessary action.

21. It is understood that this is an experiment and its continuation will depend on the cooperation of the medical profession and the recipients of medical relief, and that, should the burden of cost of this plan prove excessive, the whole matter will be reviewed and modified to meet the situation.

The agreement which physicians, who desire to have their names placed on the list of those participating in the Relief Scheme, are expected to sign follows herewith.

CONTRACT

I ———————————— a duly qualified and registered medical practitioner, in consideration of being included in the plan for medical relief for the recipients of Unemployment Relief, and their dependants, about to be put into operation in the City of Winnipeg, agree with the City of Winnipeg as follows:

1. I will conform to all regulations now or hereafter adopted by the Unemployment Relief Committee of the City of Winnipeg for the guidance of medical practitioners participating in the said plan, and, should I for any reason feel that I cannot accept relief patients under any regulations which may hereafter be put in force, I will forthwith notify the Relief Medical Officer in order that my name may be taken from the list of medical men who are participating in the said plan.

2. I will accept the scale of fees agreed upon by the joint committee of the medical profession and the Unemployment Relief Committee of the City of Winnipeg for professional services rendered by me to persons on unemployment relief in the City of Winnipeg or their dependents.

3. The decisions of the Medical Advisory Board, to be appointed under the plan for medical relief worked out between the Unemployment Relief Committee of the City of Winnipeg and the committee of the medical profession, covering any and all questions arising out of the operation of the said plan, including the taxation of any accounts for professional services rendered to recipients of unemployment relief or to their dependents by me, shall be final and binding upon me.

4. I will not look to the City of Winnipeg for any account for medical or surgical fees for professional services rendered to any person on unemployment relief in the City of Winnipeg, including his or her dependents, in excess of those approved by the Medical Advisory Board.

5. I will insist on all relief recipients, or their dependents, requiring my professional services, producing to me an authorization from the Relief Medical Officer for such service before rendering the same, provided that, in cases of emergency (of which I shall be the judge—subject to a ruling to the contrary by the Medical Advisory Board), I may render the necessary services and obtain the required authorization from the Relief Medical Officer subsequently.

6. I will, for each illness for which I may render professional services to a relief recipient or his or her dependents, ask for the production of the relief recipient's identification card, and will enter thereon the date of such services, the name of the patient attended, and will sign my name after such entries.

7. I will notify the Relief Medical Officer of any attendance made by me on persons on relief or their dependents within twenty-four (24) hours after such attendance, on forms to be supplied by the City of Winnipeg, and will forward such report as may be required by the Relief Medical Officer to him, as and when required, and will abide by any instructions the Relief Medical Officer may issue with regard to the number of visits for any case which may be charged to the City of Winnipeg.

8. I will prescribe only preparations which may appear in the British Pharmacopœia or such other similar formulæ as may be authorized by the Winnipeg Unemployment Relief Committee, and the said committee may instruct the druggist or druggists filling prescriptions under this plan not to charge to the City of Winnipeg any prescription not complying with this clause.

9. Where the services of a nurse can be employed to the advantage of the City, I will at once notify the Margaret Scott Nursing Mission.

10. No payment is to be made to me for any operation which I may perform upon anyone on unemployment relief or his or her dependents, unless the same is approved by the Relief Medical Officer of the City of Winnipeg, or the Medical Advisory Board hereinbefore referred to, this to be subject to emergency clause in clause 5.

11. I will submit my accounts for professional services rendered under the said plan to the City of Winnipeg Relief Medical Officer, on or before the 5th day of each month, for services rendered during the previous month.

12. In the event of my being alleged to be guilty of any abuse of the Medical Relief Plan of the City of Winnipeg, such alleged abuse may be reported to the College of Physicians and Surgeons of Manitoba for necessary action.

13. My name may be struck off the list of medical men participating in the said plan at any time for cause, upon recommendation of the Medical Advisory Board.

14. Should the City of Winnipeg hereafter find that it is unable to finance the cost of medical relief, or should the said City, for any other reason, deem it necessary or advisable to discontinue payment for medical and surgical relief to the unemployed, I agree that, upon notice to me of that fact, I will not look to the said City of Winnipeg for payment of any services, medical or surgical, which I may perform for any person on relief or his or her dependents, after the date fixed in such notice.

DATED at Winnipeg this.....day of.....1934.

.....M.D.

The suburban municipalities did not at first appreciate the significance of the doctors' action. The hospitals, however, pointed out to them that every municipal patient in hospital would require a doctor, engaged and paid by the municipality, and that patients would only be admitted if this condition were accepted. The associated municipalities, some of which were in the hands of administrators, at once approached the provincial government. The latter declined to accept responsibility. Finally, the municipalities were compelled to give way. Five of the largest municipalities contiguous to Winnipeg have already notified our committee that they will supply medical relief under the same plan and scale as that in force in Winnipeg. In all cases the plan is to be in operation for a period of three months.

The reaction of the municipalities in most cases, before the settlement, was to endeavour to engage part or whole time doctors to attend the sick on relief. Circulars were sent to practitioners asking them to tender for the contract. It is very gratifying to report, and speaks volumes for the organization and solidarity of the profession in Greater Winnipeg, that there is no record of any doctor making an offer to a municipality.

THE DIFFICULTIES OF THE PROFESSION: COMPLAINTS OF THE PUBLIC

BY HARRIS MCPHEDRAN, M.B.(TOR.), F.R.C.P.(C.),
Toronto

In order to understand the complaints of the public which increase the difficulties of the profession, one must keep in mind the background as depicted in the first of this series of articles. Two features of this background should be emphasized: (1) the capital expenditure necessary in order to start, build up and conduct a practice; and (2) the increased cost of medical service due to advance in science and the adoption of all modern accessories for the diagnosis and treatment of disease.

Now let us look at the problem of illness from the standpoint of the layman. Illness falls unevenly in any community. Like the soldier in battle each of us considers himself or herself immune from accident or disease. We gamble on this supposed immunity from attack and make no provision for illness. Like all gamblers, we lose from time to time, and the loss may be almost ruinous, no matter to what class financially the patient belongs.

From the standpoint of practice, the laity may be divided into three classes economically: A. those rich or well-to-do; B. those of average means; and C. those who are indigent, either temporarily or permanently.

Those of Class A complain that they are called on to pay high and sometimes excessive medical and surgical fees. They do not understand why they should pay more than the man of average means for the same kind and amount of service. "This rule", they say, "does not obtain in the commercial world. A yard of silk, a pound of tea, a suit of clothes is the same price no matter who buys it, so why the *variation* in the case of medical care?" Is there any justification for this complaint? One must admit that there is. Such a system entails first that only the sick among the rich help to pay for the sick among the poor, and, secondly, leads to a negation of our ideal as a profession to give to all, rich, middle class and poor alike every aid that science affords leading to recovery from disease. It is a human failing, not confined to doctors, to give more and better attention to those who pay the best fees, and this will obtain so long as our present system of practice holds. These people in Class A should, however, remember that down through the ages, doctors have looked after the sick poor free of charge. This was their share of charitable work arising from and interwoven with the feudal system. Some one had to pay for this service, and for centuries those who were well-to-do have done so, through the larger fees they have paid. They are still doing so. When times were good they made little complaint. In the present depression they turn on the doctors, say their fees are excessive, want reduced bills, and not infrequently contest the account in a court of law. They fail to see that they, and we, are victims of a system, deep-rooted in antiquity, unfair, unjust, inconsistent with the evolution of society, and obsolete at present.

Those of Class B complain that they cannot afford (or obtain at great sacrifice) all the benefits of modern science in the diagnosis and treatment of disease.

Is there cause for this complaint? Let us look at the average earnings of heads of families in Toronto for certain occupations in 1911, 1921, 1931.

AVERAGE EARNINGS OF HEADS OF FAMILIES IN TORONTO FOR SPECIFIED OCCUPATIONS 1911, 1921, 1931*

Occupation	*1911*	*1921*	*1931*	*Weeks employed per year*
Bakers	649.17	1280.00	952.00	44.32
Bricklayers	748.47	1142.86	800.00	28.12
Carpenters	666.39	1187.83	810.00	33.87
Chauffeurs	723.82	1084.50	875.00	43.47
Electricians	785.55	1341.53	1263.00	43.62
Labourers	512.99	965.48	515.00	32.48
Painters and Decorators	625.58	1106.57	772.00	34.84
Plumbers and Gas Fitters	724.11	1275.38	1049.00	38.40
Salesmen	842.73	1507.52	1134.00	46.28
Trainmen	911.00	1813.60		
Street Railway Employees	667.82	1363.10		

In looking at this record of earnings of those who form a great part of the artisan class one wonders, not that they find it hard to pay for medical services, but, that they live, raise and educate their families. The very thought of illness in these families is a constant source of anxiety and its occurrence, especially when the earning member is struck down, has appalling effects mentally, physically and financially on the whole household. Where the earning head through such illness is physically or mentally wrecked or killed, the result is catastrophic.

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* Extract from a paper read by Dr. W. C. Givens at The Academy of Medicine on November 30, 1933, on "The Present Difficult Position of the Practising Physician."

Those of the Class C complain that if they go to the hospital they must go to the public ward, give up their own doctor, and in large cities be used for teaching purposes.

Is there any justification for the complaint of this class? Any physician or surgeon who has worked in a public ward must have realized the upsetting effect, unaccustomed noises, sights, and horrible smells in these places, must have on the very ill, the sensitive and the convalescent. One questions, moreover, whether it is right to deprive them from contact with their family physician in whom (it may be without much reason) they have faith. Does the benefit they receive from the care of specialists and the use of all auxiliary methods of diagnosis and treatment compensate entirely for the loss of a trusted friend? Should they be used for teaching material, just because they can't pay? Is it fair on this account to offend their sensibilities, and expose to students, weaknesses common to all grades of society, just because they are poor?

From all these classes above noted come complaints that the profession as a whole has been reactionary, hostile, and unfair to those without our ranks who have brought relief to many sufferers. They say that as a profession we seem to have played the part of the dog in the manger in regard to the irregulars, and claim that we might at least have investigated the claims of the irregulars, especially as to the value of mental therapy, as practised by the Christian Scientists, and the many kinds of physical therapy as practised by osteopaths, chiropractors, etc. They say that we pose as altruists and that we are acting in the best interests of a public, which, in part, is convinced we are only safeguarding our vested interests as a closed corporation. They claim we are almost inhuman in our painful and trying scientific investigations, giving little heed to the tired, anxious, suffering patient. They admit that as a profession we are good in cases of serious illness, but assert that we pay insufficient attention to the aches and pains of the chronic grumbler, the neurasthenic, the chronic rheumatic. We are accused of saying, "Forget your troubles"; "Take this medicine"; "Come back again"; "There is nothing wrong", because we cannot satisfactorily explain either to ourselves or the patient the cause of the symptoms. Hence, it is claimed, we fail to effect a cure which an irregular with a little sympathy, a little tact, a little rubbing or moving, twisting or pulling, effects in a short time.

Is there any justification for these complaints and accusations? If there is, what steps are we as a profession taking to remove them? An attempt will be made to answer these questions in a subsequent article.

A FEW OBSERVATIONS ON THE MEDICAL CARE OF RESIDENTS IN RURAL AREAS OF ONTARIO

By WARD WOOLNER, M.D.,
Ayr, Ont.

In discussing the problems of the medical care of those who live in rural districts of Ontario, it is impossible to give a true picture of all areas. However, what pertains to Waterloo, Brant and Oxford Counties is likely to apply to other parts of older Ontario.

Up to 1930, doctors in villages or towns, doing a country practice, worried little about collections for medical services to the farmers. I have boasted that my collections in strictly rural areas were 95 per cent of my earnings. My loss was largely in the villages. Since 1930 this has been reversed, and my collections are much better from the urban than rural dwellers. The financial standing of our farmers has changed very materially during the last three years.

After a rather careful survey of this district, I find about one-half of those living in the townships are able to pay for medical care—family doctor, specialist, hospital or nurse. This class we do not need to discuss further. The other 50 per cent I would divide into three classes: (1) those on some form of relief—about 10 per cent of the population; (2) the near-indigent—15 per cent, and (3) those who pay for part of their medical care.

Class 1 being on relief, pay nothing directly for any medical care. In a few municipalities, the provincial "Order in Council" is in force, and the doctors receive part of their fees for the care of this class. In other townships the medical officer to the indigent or some other doctors may be paid by the municipality.

Class 2 are barely able to purchase sufficient food and clothing to exist. These near-indigents can pay little or nothing for medical or nursing care, and no one assumes any responsibility for this care, unless they enter a hospital, where they are usually admitted as municipal patients.

Class 3 (perhaps 25 per cent of our rural population) can pay part, but the doctor has been very fortunate if he has been able to collect 50 per cent of his usual fees from this class since the fall of prices in farm produce in 1929.

Now are there any remedies to apply or even to suggest? I am sure the only specific is better times, which would come from a general increase in the prices of farm products. Prices are a little better than six months ago, and perhaps in a year or two we will have 75 per cent or more of our rural dwellers quite able to meet any accounts for medical care.

The near indigent will always be with us, and his problem, from our standpoint, is a most difficult one to solve. No form of State Medi-

cine of which I have read covers the near indigent farmer. The hired help on the farm would be covered in a contributory scheme because he has a definite wage. This poor farmer claims he has no net income, and since in many cases he cannot meet the cost of a decent living or pay his taxes how could he contribute? His medical care should be paid for either by the plan adopted in some areas for those on relief, that is, the province and municipality would both contribute, and the doctor would be expected to accept a percentage of his usual fee; or, one or more municipal doctors could be appointed on salary, for part time services, to give the necessary care to this class. The township would be responsible for the remuneration of these physicians. There is one serious objection to municipal doctors; it violates a principle laid down by all medical associations— "The right of the patient to choose his own doctor, and the doctor his own patient."

Let us hope the times may so improve, that the present system of practice in rural areas need not be changed. It has stood the test of time.

RURAL MEDICAL RELIEF

By W. E. Park, M.B.,

Brownsville, Ont.

There are many advocates of State Medicine and many who are absolutely opposed to it. We have, however, in operation in some cities and townships a government plan of medical relief which is fairly satisfactory, as far as it goes. It is in operation in the rural section in which I reside. I receive one-half my medical fees when attending families actually on relief. However, this plan leaves much to be desired in a rural section. The reason is that everybody has a small plot of land to till. In most cases they are able to raise about enough to provide themselves with something to eat, but have nothing to sell. When unemployed they can still eat, but have no money to buy clothing, or pay the doctor. In other words, we have in rural sections a large number of indigent patients, who can never pay for medical services, because while their home-grown food lasts, they cannot receive food relief nor medical relief. The country practitioner's burden is not the few indigents on relief but the many, many not on relief.

The plan I have to propose is largely applicable to rural districts. I suggest the establishment of a Dominion Collecting Bureau. The country doctor would turn any accounts he wished into this bureau and receive immediately 35 per cent of each account. The doctor on his part would accept this 35 per cent in full settlement for his claim, and at the same time surrender the account for collection by the Bureau. The Collecting Bureau could arrange any kind of long term payments it wished, between itself and the debtor patients. The Bureau might collect all of the account eventually, or part of it, or none at all. The Bureau would, of course, have to be subsidized by the government, for a time at least. However, it would probably pay for itself in time. Private collecting agencies carry on a profitable business on a 50 per cent basis and handle the same type of accounts.

There are many things to be said in favour of such a plan. The country practitioner would be sure of 35 per cent of his poor accounts, which would cover his expenses and encourage him to give the poor as good care as his paying patients. Thirty-five per cent is not large enough to induce the doctor to put all his accounts through the collecting agency. He could still carry on an independent practice and send his own accounts direct to his non-indigent patients. On the other hand, if a doctor found himself in straitened circumstances he could turn some of his better accounts over to the Bureau and receive money at once, while the Bureau would profit on the same by waiting longer. It would be entirely optional whether the doctor used the collecting Bureau or not. He could still collect all his own accounts if he wished. He could still do all the charity work he wished, by not collecting either personally or through the bureau. This is not State Medicine in the ordinary sense. The doctor would not receive a salary from the state. All doctors could share in the benefits just as much, or as little, as they wished, depending upon the character of their practice. There would be no discrimination between doctors. The patient could go to any doctor he chose and not be required to go to a doctor paid by the state. The patient could desert one doctor and go to another if he wished. There would be complete freedom of action for both patient and doctor. The patient would not need to deny himself any form of medical or surgical care, because he could get it when and where he wished. The patient would not be inclined to abuse the system, because he would know that he must pay for it himself according to his means. The long-term payments which could be arranged with the Bureau would practically amount to a loan, so far as the patient was concerned, which he would feel himself responsible to pay, and would not undertake unnecessarily. The patient could receive medical care without sacrificing his self-respect. The Collecting Bureau could investigate a person's ability to pay and act accordingly. All the money collected could be kept in one common treasury from which operating expenses and the doctor's 35 per cent would be taken. The deficit, if any, would be made up by government subsidy. This would mean that the Dominion as a whole would be taxed to pay for medical care of indigents who were unable to

pay. The amount actually coming from the tax payer would be only the difference between the amount collected and 35 per cent of all accounts submitted, plus operating expenses. The burden of medical relief would be carried equally by the whole of Canada, but the benefit would automatically go to the sections needing it most. The management of a central Collecting Bureau would be economical. Its ramifications would be so great that no debtor could escape his obligations anywhere in Canada. The Bureau could easily keep track of transients and their obligations could be kept together. If the Bureau wished, it could cooperate with a government employment agency, to find work for its debtors, and thus facilitate the collection of accounts. All other forms of medical relief could be discontinued and conducted through the Dominion Collecting Bureau. A basis could even be worked out to handle the hospital bills for indigents in a similar way, particularly in small hospitals where the expense already comes back on the county in the form of a county grant. Many details would have to be worked out, but I offer this now as a suggestion for Rural Medical Relief.

At the last meeting of the Saint John Medical Society in February, the subject of medical attention for indigent patients came up for discussion. A strong committee was appointed, under the chairmanship of Dr. Barry, to present a resolution to the Municipal Council. A synopsis of this resolution follows:—

"Whereas the number of indigent persons in this municipality is enormously increased and is increasing; and whereas a great number of people who formerly paid their own family physician are now availing themselves of the free services of the hospitals and clinics; and whereas medical, surgical, obstetrical, pædiatric and special services are supplied in the Out-Patient Clinics by those same physicians at no salary and at no cost to the municipality; and whereas there is a further group who are unable to pay for medical attention and who are more appropriately treated at home or at the office of the physician; and whereas the aforementioned physicians in spite of carrying the load of free medical service at no cost to the community and sacrifice a great portion of their time which they might otherwise use to their own advantage are taxed on income as citizens to provide these same services; and whereas in addition they have recently been taxed a further special amount on their offices; and whereas no other professional calling or industry is called upon to render free service involving so great responsibility or requiring so much sacrifice, therefore be it resolved that we, the Saint John Medical Society, request that the Municipal Council arrange to recompense medical attendants of all persons whom it is considered are entitled to medical attendance at the public expense, whether in hospital or at home or at the physician's office, on such a basis as may be arranged between the representatives of the Municipal Council and this Society." (From A. Stanley Kirkland, Saint John, N.B.)

Association Notes

The Sixty-fifth Annual Meeting of the Canadian Medical Association, Calgary, June 18th to 22nd, 1934

The time is fast approaching when the meeting of our Association at Calgary will be a reality. It is ardently hoped by the members of the Central Committee in this city that physicians in every city and town of our Dominion are looking forward to this event and are making preparation to attend. The scientific part of the program has in large measure been completed and promises to be one of unusual interest from every point of view, as papers which should be of much value to the profession have been promised.

The local committee has finished the initial work of organization and only the details have to be brought to a conclusion. Much attention has been given by both the ladies' and our own committee to provide an abundance of entertainment for our guests, which will include motor trips to places of interest outside of Calgary, afternoon teas, golf, tennis and other outdoor amusements. There will also be a motor trip to Banff and Lake Louise. The transportation committee expects to have data from the railway companies in a short time regarding special rates. During the past summer there were very low rates to this part of the west and it is hoped that similar rates will be in vogue this summer.

The Publicity Committee, under the chairmanship of Dr. G. A. Anderson, has prepared a fifty-two page booklet, which in an illuminating way describes the education, the cultural, the recreational and other aspects of life in this the Foothills City.

Every member of our Association will receive a copy of this brochure.

G. E. LEARMONTH,

on behalf of the Local Publicity Committee, C. M. A.

PRELIMINARY PROGRAM

Convention Headquarters — The Palliser Hotel.

Monday, June 18th

9.15 a.m.—Meeting of Council.
1.00 p.m.—Luncheon—guests of the President. Valedictory Address—Dr. G. A. B. Addy, Saint John.
2.30 p.m.—Meeting of Council.
6.00 p.m.—Meeting of Nominating Committee.
7.30 p.m.—Dinner to members of Council; guests of the Calgary Medical Society.
Address—L. W. Brockington, City Solicitor, Calgary.

Tuesday, June 19th

9.15 a.m.—Meeting of Council.
1.00 p.m.—Luncheon.
Address—Ven. Archdeacon Swanson.
2.30 p.m.—Meeting of Council.
7.30 p.m.—Dinner to Council—guests of the Alberta Medical Association.
Address—Dr. R. C. Wallace, University of Alberta.
7.30 p.m.—Public meeting under the auspices of the Canadian Public Health Association. Speakers — Dr. J. G. FitzGerald, Dean of the Faculty of Medicine, University of Toronto; Dr. A. Grant Fleming, Department of Public Health and Preventive Medicine, McGill University. Introduced by Dr. T. C. Routley, General Secretary, Canadian Medical Association.

Wednesday, June 20th

8.30 a.m.—Registration.

SECTION A

9.15 a.m.—Dr. R. G. Ferguson, Fort San, Sask.:—"Some simple observations and procedures of assistance in the diagnosis of tuberculosis by the general practitioner".
Dr. Harold, Orr, Edmonton:—"The reactions attending the intravenous use of the arsphenamines".
Dr. W. P. Tew, London:—"Recent advances in obstetrics and gynæcology".
Dr. Wesley Bourne, Montreal:—"An estimate of the usefulness of some of the newer anæsthetics in practice".
Dr. Howard Spohn, Vancouver:—Subject to be announced.

SECTION B

9.15 a.m.—Dr. D. S. Macnab, and Dr. E. P. Scarlett, Calgary:—"The value of glucose in medical and surgical conditions and its mode of introduction".
Dr. F. W. Marlow, Toronto:—Subject to be announced.
Dr. D. W. MacKenzie, Montreal:—"Some factors in renal infection".
Dr. F. P. Patterson, Vancouver:—"Acute septic osteomyelitis".
Dr. P. H. T. Thorlakson, Winnipeg:—"Surgery of the biliary tract".
12.30 p.m.—Luncheon:—
Address of Welcome—The Mayor of Calgary.
Address: "The functions and responsibilities of the Council of the Canadian Medical Association".

Wednesday, June 20th

GENERAL SESSION

2.00 p.m.—President's Address.
Dr. E. S. Moorhead, Winnipeg:—"Commonwealth versus self-sufficiency".
Dr. F. G. Banting, Toronto:—"Resistance to experimental tumour".
Dr. J. C. Meakins, Montreal:—"Amœbic dysentery in Montreal District in 1933-34".
Dr. Max Cutler, Chicago:—Subject to be announced.
7.30 p.m.—Association Dinner and Dance.
Address of Welcome—His Honour, the Lieutenant-Governor of Alberta, W. L. Walsh.
Address—The Right Honourable R. B. Bennett, Prime Minister of Canada.

Thursday Morning, June 21st

SECTION A

9.15 a.m.—Dr. Daniel Nicholson, Winnipeg:—"Types of malignant disease treated by radium at the Cancer Relief and Research Institute in Manitoba".

Dr. Geo. S. Young, Toronto:—
"Differential diagnosis of coma".
Dr. John R. Fraser, Montreal:—
"The inflammatory pelvis".
Dr. J. M. Frawley, Fresno, Cal.:—
Subject to be announced.
Dr. H. H. Hyland, Toronto:—
"Some observations on the liver treatment of subacute combined degeneration".
Dr. J. D. Adamson, Winnipeg:—
"Bone-marrow efficiency".

SECTION B

9.15 a.m.—Dr. Fulton Risdon, Toronto:—
"The surgical repair of facial injuries and harelip and cleft palate congenital deformities".
Dr. Emerson Smith, Edmonton:—
"Hæmaturia".
Dr. A. D. Campbell, Montreal:—
Damage to the birth canal and its repair".
Dr. K. G. McKenzie, Toronto:—
"Treatment of fracture-dislocation of the spine".
Dr. W. E. Gallie, Toronto:—"The surgical treatment of infantile paralysis".
Dr. Gordon Fahrni, Winnipeg:—
"The association of cystic bone disease with increased parathyroid function".

12.30 p.m.—Luncheon.
Annual Meeting, Canadian Medical Protective Association.

Thursday Afternoon, June 21st

2.00 p.m.—General Session:—
Symposium on Cancer:—
Introduction—Dr. A. Primrose, Toronto;
Surgery—Dr. D. C. Balfour, Rochester;
Radiology—Dr. E. E. Shepley, Saskatoon;
Pathology—Dr. W. J. Deadman, Hamilton.

8.30 p.m.—Blackader Lecture:—
Dr. Jas. Craigie, Toronto:—"Some aspects of virus infections, with special reference to virus diseases of childhood".

Friday Morning, June 22nd

SECTION A

9.15 a.m.—Dr. Wm. Webster, Winnipeg:—
"The relative merit of nitrous oxide and ethylene".
Dr. Campbell Howard, Montreal:—
Subject to be announced.
Dr. Urban J. Gareau, Regina:—
"Analysis of twenty-three cases of acrodynia with special consideration of their incipiency and etiology".
Dr. C. A. Barrager, Edmonton:—
"The Sexual Sterilization Act of Alberta".
Dr. J. B. Collip, Montreal:—
Subject to be announced.

SECTION B

9.15 a.m.—Dr. F. A. C. Scrimger, Montreal:—
"Clinical experience of sixteen cases of staphylococcus septicemia treated by anti-staphylococcus serum and active immunization by formalized toxin".
Dr. J. A. Nutter, Montreal:—
"Chronic arthritis".
Dr. Gordon Kenning, Victoria:—
"Acute pancreatitis".
Dr. C. W. Burns, Winnipeg:—"Delayed rupture of the spleen".
Dr. Oliver Waugh, Winnipeg:—
"Cranio-cerebral injuries".
Dr. H. M. Harrison, Toronto:—
"Periodic health examinations and the general practitioner".

12.30 p.m.—Luncheon.
Annual Meeting, Alberta Medical Association.

Friday Afternoon, June 22nd

2.00 p.m.—General Session:—
Symposium on Cardio-vascular Disease:—
Dr. Duncan Graham, Toronto;
Dr. John Oille, Toronto;
Dr. John Hepburn, Toronto;
Dr. C. C. Birchard, Montreal.

Wednesday, June 20th

SECTION OF EYE, EAR, NOSE AND THROAT

9.15 a.m.—Dr. E. McCusker, Regina:—"Diagnosis and treatment of tuberculosis of the eye".
Dr. Ralph Fenton, Portland, Ore.:—
"Recent discoveries in the pathology of nasal and aural mucosa".
Dr. S. R. Gifford, Chicago:—"The treatment of glaucoma".

Thursday, June 21st

9.15 a.m.—Dr. Jos. A. Sullivan, Toronto:—
"The surgical repair of facial palsy by an autoplastic nerve graft".
Dr. S. R. Gifford, Chicago:—
"Corneal infections".
Dr. Gordon New, Rochester, Minn.:—
"The curability of malignant tumours of the upper jaw and antrum".

Friday, June 22nd

SECTION OF MILITARY MEDICINE

12.30 p.m.—Luncheon for all over-seas officers and officers of the non-permanent active militia—guests of Dr. J. N. Gunn, D.S.O.
Addresses: — Colonel F. C. Bell, C.M.G., M.D., C.M., Vancouver. Subject to be announced.
Major F. C. Clarke, M.C., M.D., C.M., Calgary:—"Clearing the field in the future".

Wednesday, June 20th

SECTION OF RADIOLOGY

20 minutes for each paper.
10 minutes for discussion.

9.00 a.m.—Dr. Digby Wheeler, Winnipeg:—"Para-nasal Sinuses — Ethmoids".
9.30 a.m.—P. A. Macdonald, M.Sc., Ph.D., Winnipeg:—"Radiation Standards and their Practical Application".
10.00 a.m.—Dr. Richard Proctor, Edmonton:—"Treatment of Hodgkin's Disease from a Radiological Viewpoint".
10.30 a.m.—Dr. H. H. Murphy, Victoria:—"Epiphysitis".
11.00 a.m.—Dr. Max Cutler, Michael Reese Hospital, Chicago, Ill. Subject to be announced.

Thursday, June 21st

9.00 a.m.—Dr. Geo. H. Malcolmson, Edmonton:—"A radiological study of the development of the spine and pathological changes in the intervertebral discs".
9.30 a.m.—Symposium on the relationship of the radiologist to some phases of medical practice.

1. Dr. B. J. Harrison, Vancouver:—"Relationship of the radiologist to the hospital".
2. Dr. E. E. Shepley, Saskatoon:—"Standing of the radiologist in the treatment of disease with radium".
3. Dr. C. W. Prowd, Vancouver:—"Relationship of the radiologist to public organizations; *i.e.*, health insurance boards, workmen's compensation boards, etc.".
4. Dr. C. M. Henry, Regina:—"Relationship of the radiologist to the profession".

10 minutes each. 20 minutes for discussion.

10.30 a.m.—Election of Sectional Officers and Business Meeting.

Saturday, June 23rd

The delegates will be taken to Banff and the mountains. Free transportation will be provided for the delegates, who will look after their own entertainment. Luncheon will probably be at Banff Springs Hotel, $1.50 per plate. Dinner, room and breakfast at the Chateau, Lake Louise, (American Plan), $7.25 each with two in one room.

OTHER TRIPS

1. To the Prince's Ranch; available any day, as requested by delegates, and return via Turner Valley if desired.
2. Stampede, Sarcee Reserve, at 3.00 p.m. on Friday. Free to everybody.

IDENTIFICATION CERTIFICATES

Arrangements are being made for the use of Identification Certificates. Write to the General Secretary, 184 College Street, Toronto, for a certificate. This permits you to purchase your transportation at the rate of single fare and one-third for the round trip.

Notices of Motion

1. Dr. F. N. G. Starr has given notice of motion that Chapter 4, Section 2, of the By-Laws of the Association be amended to read as follows:—

> Where any section fails for any cause to appoint sectional officers for any year, it shall be in order for the Executive Committee to nominate officers for that section for that year.

2. Dr. J. S. McEachern has given notice of motion that the By-Laws of the Association be so amended as to permit of naming the place of the annual meeting at least two years in advance.

Hospital Service Department Notes

Hospitals in Canada which are Approved for Internship

The hospitals which are herein specified as "approved" provide their interns with the clinical and other facilities, the organization and the opportunities for study and experience which are outlined as essential in the Basis of Approval for Internship of Hospitals in Canada prepared by the Department of Hospital Service of the Canadian Medical Association. These 29 hospitals with 396 internships can furnish recent graduates with highly desirable internships.

Because of the frequent desire of young graduates in both Canada and the United States to take internship in the other country,

APPROVED GENERAL HOSPITALS

Name of Hospital	Location	Bed Capacity (excl. bassinets)	DISTRIBUTION OF BEDS						INTERN SERVICE				
			Medical	Surgical and Gynæcological	Obstetrical	Pædiatric	Communicable Diseases and Tuberculosis	Other Departments	Number of Interns	When Selected	Internship Begins	Salary (first year)	Rotation or Straight
Victoria General	Halifax	250	50+	115+	—	15	3	70 (Priv.)	Varies	May	May 15	Yes	Rot.
*St. John General	St. John	344	54+	101+	42+	31	40	76 (Priv.)	8	Prev. fall	July 1	Yes	Rot.
*Children's Memorial	Montreal	230	79	58	—	49	13+26 Tbc.	5 (Priv.)	6	December	July 1	Yes	Both
*St. Luc	Montreal	407	92	158	—	16	24 V.D.	117	12	April	July 1	Yes	Rot.
*Montreal General	Montreal	489	92+	137+	—	29	Yes	100 Pub. 131 S.P.	47	December	July 1	No	Jr. R.; Sr. S.
Royal Victoria	Montreal	673	119	349	124	15	Yes	66 (E.E.N.T.)	45	March	July 1	No	Str.
Ottawa Civic	Ottawa	600	75+130 pr.	135+170 pr.	25+65 pr.	Yes	—	Yes	17	January	July 1	Yes	Rot.
Kingston General	Kingston	400	95+	105+	28+	36	33 (Tbc.)	103	4 grad.+11	January	June	Yes	Rot.
Grace	Toronto	121	38	50	33	—	—	Yes	4	By Easter	July 1	Yes	Rot.
*Sick Children	Toronto	400	Yes	Yes	—	Yes	15—45	Yes	17	Jan. or Feb.	July 1	No	Rot.
*St. Joseph's	Toronto	250	100	80	34	16	20 (Tbc.)	Yes	6	Jan.-May	July 1	No	Rot.
St. Michael's	Toronto	600	100+	127+	30+	—	—	132+Private	24	December	July 1	No	Rot.
Toronto East General	Toronto	139	44	67	28	—	—	Yes	2	April 1	July	Yes	Rot.
*Toronto General	Toronto	1,050	254+	334+	70+	—	Yes	58+300 pr.	43	January	July 1	No	Rot.
Toronto Western	Toronto	348	107	143	42	—	—	Yes	15	December	July 1	Yes	Rot.
Hamilton General	Hamilton	618	144	193	47	78	94	Yes	16	December	July 1	Yes	Rot.
*St. Joseph's	London	300	60	87	47	46	—	60	6	Jan. 15	July 1	Yes	Rot.
*Victoria General	London	400	60+	50+	30+	80	21	41+pr.	12	December	July 1	Yes	Rot.
*Metropoljtan Gen.	Walkerville	123	Yes	Yes	29	20	Yes	Yes	2	January	July 1	Yes	Rot.
St. Joseph	Windsor	113	30	46	20	17	—	Yes	2	May	July 1	Yes	Rot.
*MacKellar General	Fort William	203	78	65	30	30	Yes	V.D.	3	January	June 1		Rot.
*Children's	Winnipeg	140	Yes	Yes	—	140	—	Yes	7	January	June 1	Yes	Rot.
*Winnipeg General	Winnipeg	611	220	306	31	32	—	23	25	Nov. 1	June 1	No	Rot.
*St. Boniface	St. Boniface	438	111	242	35	50	(100)	(200)	18	October	June 1	Yes	Rot.
Regina General	Regina	361	67	130	36	34	30	64 (23 psych.)	8	October	July 1	No	Rot. Str.
Misericordia	Edmonton	175	72	45	40	12	6	Yes	2	May	May 1	Yes	Rot.
*Royal Alexandra	Edmonton	500	100+	100+	50	60	100+20 Tbc.	Yes	6—8	January	May & July	Yes	Rot.
*Univ. of Alberta	Edmonton	365	109	143	Yes	36	20 Tbc.	57	10	May	July 1	Yes	Rot.
St. Paul's	Vancouver	336	Yes	Yes	34	20	—	Yes	4	January	July 1	Yes	Rot.

RECOMMENDED HOSPITALS

*Homeopathic	Montreal	90	30	35	25	5	—	Yes	3	Feb. 1	June 15	Yes	Rot.
*Woman's General	Montreal	185	35	54	46	35	5	10	6	August	August	Yes	Rot.
Ottawa General	Ottawa	330	44	124	20	60	6	76	8	January	July 1	Yes	Rot.
Christie Street	Toronto	545	279	230	—	—	36 Tbc.	Yes	3	April	July 1	Yes	Rot.
Brantford General	Brantford	181	36	36	19	34	20	+36 pr.	2	January	July 1	Yes	Gen.
Westminster	London	625	75	10	—	—	40 Tbc.	500	2	May	July	Yes	Rot.
*St. Catharines Gen.	St. Catharines	150	30	66	20	24	10	Yes	2	Jan. or Feb.	July 1	Yes	Rot.
St. Joseph's	Port Arthur	149	49	58	28	8	2	Yes	1	June	July 1	Yes	Gen.
*Grace	Winnipeg	104	29 w. surg.	Yes	65	6	Yes	Yes	2 grad.+3	Varies	July	No	Rot.
Miscericordia Gen.	Winnipeg	225	Yes	Yes	40	10	Yes	Yes	2	Nov. & Jan.	June 1	Yes	Rot.
*Moose Jaw General	Moose Jaw	180	Yes	Yes	23	12	30+10 Tbc.	Yes	2	Feb. & Mar.	June	Yes	Rot.
Saint Paul's	Saskatoon	240	75	90	22	30	Yes	23	3	October	June	Yes	Rot.
Saskatoon City	Saskatoon	274	159 w. surg.	Yes	24	30	28+9 V.D.	24	8	December	July 1	Yes	Rot.
*Edmonton General	Edmonton	157	Yes	Yes	18	40	—	Yes	2	December	July	Yes	Rot.
*Vancouver General	Vancouver	1,037	200 (appr.)	300 (appr.)	111	116	117	182	35	Nov.-Dec.	July 1	Yes	Rot.
Royal Jubilee	Victoria	294	199 w. surg.	Yes	30	25	—	40	2	December	July 1	Yes	Gen.

*Women interns accepted.

it has been arranged that this list of acceptable internships and that of the Council on Medical Education and Hospitals of the American Medical Association be reciprocally approved. Arrangements have been made also whereby credit for an internship in an approved Canadian hospital will be given by the National Board of Medical Examiners.

As there are a number of good hospitals in Canada which can provide their interns with an excellent training, although, for one reason or another, they do not fully comply with the provisions of the Basis of Approval, it was the desire of the Committee that certain of these hospitals be placed temporarily upon a "recommended" list. This group of 16 hospitals with 86 internships is also attached.

1934 Revision of Hospitals Approved for Internship

The 1934 list of hospitals in Canada which are either approved or recommended for internship has been issued by the Department of Hospital Service of the Canadian Medical Association. This revision includes three approved hospitals which did not appear in the 1933 issue: St. Justine Hospital, of Montreal; Notre Dame Hospital, Montreal, and the Hôpital du St. Sacrament, Quebec City. In addition, the Edmonton General Hospital has shown so much improvement during the past year that the committee on approval has changed it from the recommended to the approved list. Altogether in Canada there are 33 approved hospitals offering 459 internships and 15 recommended hospitals with 92 internships. Last year there were but 396 internships available in approved hospitals. This increasing number of available posts in Canada is much appreciated by the graduate students who are finding that opportunities for post-graduate study in the United States are much more restricted than formerly.

A survey of the facilities for internship training in Canada indicates a considerable improvement since a criterion of approval was set up by the Canadian Medical Association. Medical staff organization and staff interest in the work of the interns has been much improved in this interval. A large number of the medical staffs have been departmentalized, intern schedules have been definitely organized, intern committees have been appointed, and the medical staffs as a whole have shown a remarkable increase in interest in the welfare of the interns. Hospital libraries have been established or augmented, staff meetings have been improved, and housemen's quarters have been renovated.

Of particular interest has been the increase in autopsy percentages. In almost every instance post-mortem examinations in the various hospitals have shown an increase. During the last year autopsies have increased from an average of 28 to 34.8 per cent. This in itself is well worth while. The highest percentage in the last returns was that of the Montreal General Hospital, which reported 88. The highest annual returns of any hospital reported for the internship approval list was that of the Westminster Hospital at London (Department of Pensions and National Health), which reported for the preceding year 15 post-mortem examinations for 16 patients. One western hospital among other improvements raised its percentage in one year from 15 to 42.5.

Nor have the interns been the only ones to gain. Without doubt the work in the hospital has been rendered much more efficient by the presence of these keen young graduates in the hospital. Some of our hospitals in previous years have had difficulty in obtaining their quota. The interns have proved a great stimulus to the scientific work in the hospitals; records have been better written; laboratory studies have been more complete; staff meetings have been more fruitful; and these young men and women have stimulated interest in new methods and treatments.

Medical Societies

The Academy of Medicine of Toronto

From January 8th to 12th, a special lecture course on the cardio-vascular-renal system was held under the auspices of the Academy. This was the fifth course to be given since the inauguration of these lectures in 1929, and was a great success. An invitation had been extended to all practising physicians in Ontario, and the average attendance was 145. The meetings, of which there were five, were held at 4 p.m. and tea was served.

The Library and Historical Night was held on January 2nd when presentations were made with suitable remarks by the donors. Special reference was made by Dr. Jabez Elliott, on behalf of the Library Committee, to a gift of 150 volumes from Dr. C. A. Hodgetts, of Ottawa. The majority of these were very valuable and not previously in the possession of the library. The guest of the evening was Dr. A. E. Lavell, Provincial Historian, who gave a delightful account of some of the outstanding incidents in the life of the late Dr. Joseph Workman.

The stated meeting in February was addressed by Dr. W. G. MacCallum, of Johns Hopkins University, on the subject "Glomerular changes in nephritis." Except for a few introductory remarks, the lecturer talked entirely from excellent lantern slides, used to drive home his views on the character and location of glomerular changes in this disease.

The Academy, through the work of a special Centenary Committee and a number of subcommittees, is arranging for a celebration during this centennial year of the City of Toronto. Every effort is being put forth to collect and arrange all possible data relating to medicine in Toronto during the last hundred years. A great deal of very valuable and interesting material has already been collected, which has been given or permanently loaned to the Academy, and which will form part of a medical museum to be housed here.

GILBERT PARKER

The Montreal Physiological Society

CERTAIN ASPECTS OF IRON METABOLISM AND IRON THERAPY*, by J. F. McIntosh.

From a brief résumé of the progress made in the investigation of experimental anæmia it is clear that an understanding of iron metabolism cannot be reached merely by a study of hæmoglobin formation. It is essential to know the behaviour of the non-hæmoglobin iron of the body as well. Thus by a study of the iron-content of the liver in rats with experimental anæmia, before and after administration of iron, Elvehjem and Sherman were able to prove that copper is necessary for hæmoglobin synthesis in the body, but that it apparently has nothing to do with the absorption of iron.

This type of investigation is not available for the study of clinical anæmia. A systematic study of the non-hæmoglobin iron of the blood in clinical anæmia might be expected to be of value. When blood is treated with 0.4 per cent hydrochloric acid, Barkan finds 0.1 to 1.7 mg. per cent of iron in the ultra-filtrate. Nine-tenths or more of this iron is contained in the red cells. It cannot be increased by the addition of iron to blood *in vitro*, nor *in vivo* by iron administration. Nevertheless, Barkan believed that it represents the "transport iron" of the body.

When whole blood is precipitated with trichloracetic acid, and filtered within fifteen minutes, the filtrate shows on analysis values for iron similar to those given by Barkan. A considerable number of bloods were studied from a group of clinical cases, including cases of pernicious anæmia, hypochromic microcytic anæmia, and anæmias secondary to hæmorrhage or infection, as well as cases without any anæmia. This non-protein iron amounts to about 2 per cent of the total iron in the blood. The percentage is relatively constant, and bears no relation to the type of anæmia.

If the precipitate is allowed to stand for some hours in contact with the supernatant, the filtrate assumes a slight brownish tinge, and the iron content increases by about 150 per cent. The reaction appears to be complete in about five days. This result resembles those of Lintzel, who found that hæmoglobin was decomposed to the extent of 5 to 10 per cent, by similar treatment.

These findings would lead one to think that this filtrate iron is not the "fer circulant", the study of which might be expected to yield important results. It seems more likely that it is a constituent part of the red cell, which may be closely associated with the hæmoglobin, but is probably not united with the molecule in the same way as the major part of the iron which the latter contains. The shape of the curve does not enable one to say whether the filtrate iron is a single entity, or made up of two or more moieties, corresponding to the values obtained by Barkan and Lintzel, respectively.

THE DIURETIC ACTION OF PITUITARY EXTRACTS AND THE RESPONSIBLE PRINCIPLE OR CONSTITUENT*, by K. I. Melville and D. V. Holman.

A method is described for accurately observing small changes in the rate of urine secretion in the anæsthetized rabbit. Using this procedure, it is shown that the two pressor preparations from the pituitary gland, pitressin and postlobin-V, show approximately equal diuretic effects in the urethanized rabbit. The two oxytocic preparations, pitocin and postlobin-O, also exert equal effects, but higher dosages (twenty-fold) are required. Finally, comparisons of all four preparations on the basis of pressor content suggest that the diuretic effects observed are due to pressor material present in each preparation (contaminating pressor substance in the case of the oxytocic preparations). The oxytocic constituent probably exerts no diuretic action.

* Abstract of a paper read before the Montreal Physiological Society, on February 19, 1934.

The Saint John Medical Society

At the monthly meeting of the Saint John Medical Society held in the Admiral Beatty Hotel, the speaker for the evening was Dr. W. O. McDonald. His carefully prepared paper dealt with the present-day treatment of

* Abstract of a paper read before the Montreal Physiological Society, on February 19, 1934.

diabetes. Dr. McDonald also summarized the major points in the physiology and pathology of this disease. In the discussion which followed, a great many questions were asked of the speaker, especially in relation to the subject of surgery in diabetic patients. At this meeting the accounts of the local Canadian Medical Association Committee were finally closed. A special vote of thanks was passed to Dr. V. D. Davidson, chairman of the Finance Committee.

A. S. KIRKLAND

The Toronto Biochemical Society

The 27th meeting of the Society was held in the Botany Building, Toronto University, on February 15, 1934. The following communications, reported here in abstract, were received, among others.

HYPERVITAMINOSIS D RICKETS AND THE ACTION OF VITAMIN D, by A. W. Ham and M. D. Lewis.

Young rats were fed one to two drops of activated ergosterol, 10,000 X per day for three weeks. The long bones at autopsy showed lesions comparable to those produced by high-phosphorus, low-calcium rachitogenic diets. The main features of the histological picture were the increased number of trabeculæ in the medullary cavity, the narrow epiphyseal plate, the presence of a great deal of osteoid tissue in the trabeculæ and on the cortex under the periosteum, and evidences of resorption of the original shaft of the bone. As osteoclasts formed an insignificant part of the histological picture, and as the matrix which formed during the vitamin D administration was poorly calcified, it was concluded that vitamin D in enormous doses acted by preventing calcification of bone which formed during the experimental period, and not by stimulating osteoclasts to resorb calcium which was being deposited in a normal fashion. The results could be explained by a theory already presented in previous work. (Ham, Ham and Portuondo, Schour and Ham).

ACETYLCHOLINE AND THE BLADDER MECHANISMS, by M. H. Roepke and V. E. Henderson.

Perfusion fluid collected from the bladder during stimulation of its parasympathetic nerve supply contains an acetylcholine-like substance, usually of concentrations from 1-80 to 1-160 millions, as shown by tests on perfused frogs' hearts. A study of the bladder contractions produced by nerve stimulations and intra-arterial injections of acetylcholine show that before atropine low concentrations of acetylcholine produce tonus responses due to a direct action on the muscle. After atropine the contractile responses obtained by high concentrations of acetylcholine are like those obtained by nerve stimulation, and are due not to a direct action on the muscle but to a stimulation of the ganglia of the parasympathetic nerves by the acetylcholine, for after painting the ganglia with nicotine (1 per cent) both nerve stimulation and acetylcholine injections are no longer effective. The bladder appears to possess a tonus mechanism and a contractile mechanism, each with its special type of parasympathetic nerve fibre. One type raises tonus by the liberation of acetylcholine at the endings, and the other produces a rapid contraction, probably by the production of a humoral substance peripherally other than acetylcholine. Acetylcholine appears to be the chemical transmitter of the nerve impulses across the synapses of the parasympathetic ganglia, as is true for the sympathetic ganglia.

CONTROL OF THE CIRCULATION THROUGH THE BRAIN, by L. Irving and M. S. Welch.

The circulation through the brain of dogs is capable of increasing or decreasing quite independently of changes in blood flow through the leg. Blood samples from the superior sagittal sinus (brain), femoral vein, and brachial artery, taken simultaneously, showed the difference between arterial and venous blood in brain and leg during normal respiration. Then, under altered conditions of respiration, blood samples were analyzed again. The comparison of the amount of O_2 removed from the blood under the normal and altered respiratory conditions permitted an estimate of the change in flow of the blood. When 10 per cent CO_2 in O_2 was inhaled the blood CO_2 content increased, and the blood flow through the leg diminished (5 experiments). During inhalation of 10 per cent O_2 in N_2 the blood O_2 and CO_2 content were depleted, and the flow through the brain diminished, but changed irregularly in the leg (5 experiments). Other observations agreed with these measured results. Examination of the respiratory quotients shown by the blood changes indicates that the measurements are essentially correct. The results demonstrate the differential control of the circulation, which provides more blood to the brain as a result of the accumulation of CO_2 in the blood, and less with depletion of the CO_2 content of the blood. These stimuli are related to asphyxial conditions, and indicate a type of vascular control which would conserve the available oxygen for the brain if respiration were arrested.

E. J. KING

Special Correspondence

The London Letter

(From our own Correspondent)

Last month's letter mentioned the suggestions made with regard to the voluntary sterilization of mental defectives. This time record must be made of another advance in public opinion which would have shocked our grandfathers. Lord Dawson has introduced a Bill into the House of Lords for regulating the sale of contraceptives. These he described as "part of our social fabric" and the object of the proposed legislation is to protect the adolescent and young child from the obtrusive display and sale of contraceptives. Automatic machines now supply these articles in many large towns and large quantities of circulars reach young unmarried people of both sexes through the post. Under the Act, if it becomes law, all this would be prohibited. Opposition in the debate on the second reading ran on various lines,—from a defence of liberty to an attack on birth control—but there was an absence, as Lord Dawson himself pointed out, of any constructive alternative. Ever since the Ministry of Health, nearly four years ago, sanctioned the facilities for birth control advice in the clinics run by local authorities, on health grounds, (*i.e.*, gynæcological for the most part), many people have urged that economic and other considerations ought also to be allowed as reasons for having such advice given. It is hoped in certain quarters that it will not be long before at municipal clinics (as is already available at a limited number of private clinics) advice on birth control will be given to any married woman who asks for it. The importance of Lord Dawson's bill is to secure that the sale of contraceptives is not pressed upon the young and unmarried, and that there are no automatic machines outside the doors of the municipal clinics of the future!

Unqualified healers, especially of the "one cure for every disease variety," always complain of the lack of machinery in the medical profession for the adequate testing of any new remedy. The Therapeutics Trials Committee appointed by the Medical Research Council in 1931 meets this demand, and in a recent report on the value of serum for pneumonia it has shown very well how this large-scale type of team work can be carried out. Workers at four centres, Aberdeen, Edinburgh, Glasgow, and London, have investigated well over a thousand cases of lobar pneumonia during two winter seasons, and treatment by serum has been used for over a quarter of these—a proportion of the Type I and II cases, selected mostly by taking alternate cases for serum or not, other parts of the treatment remaining the same. Full details are given in the medical journals, but the important conclusions are that the concentrated serum definitely reduces mortality in the age-groups 20 to 40, but not between 40 and 60. Some good effect was also noticed on the length of illness and the tendency to empyema among the survivors.

Another important piece of work, sponsored and supported by the Medical Research Council, has also recently been the subject of a report—that on diet and the teeth by Mrs. Mellanby. For many years she has sought to prove that dental caries in the human subject was essentially a dietetic (*i.e.*, general) rather than a local problem (*i.e.*, cleanliness, etc., of the teeth). The last report represents the final stage in the work and the case thus built up is a most conclusive one. Caries is more common in badly developed teeth, and these are more common where diet is defective. The destruction of the teeth can be largely checked by suitable modifications of diet as shown in certain large-scale experiments on school children. Communities anywhere in the world where freedom for dental caries exists can be shown to have satisfactory dietetic habits. The important point about diet is an adequate supply of minerals and the calcifying vitamin, and not too much of the cereal type of food which is becoming so popular for the young. Vitamin D, rather than the tooth-brush, appears to be the important factor to keep the teeth from the ravages of caries. In this connection the proposal that all school children, and even those under school age, shall receive a daily ration of fresh milk is of some importance. While other parts of the world are dealing with over-production by burning crops or shovelling grain into the sea, our politicians have recently shown a remarkable contrast by suggesting that the surplus milk available under the policy fostered by the Milk Marketting Board should be used for supplying the local authorities at a low cost. The extra ration of milk has been shown in several experiments to promote better growth and development, bodily and mental, as compared with control children. The only unsatisfactory feature of the suggestion hinges round the use of the word "fresh" as a designation of the milk. As a profession we are getting rather tired of telling the public of the dangers of raw milk—2000 deaths annually from bovine tuberculosis, undulant fever, scarlet fever, streptococcal sore throats (with 65 deaths in one recent outbreak traced to an infected dairyman and carried by "certified" milk—the most expensive brand!). Farmers boast of the health they enjoy on any sort of milk, and eminent laymen write to the papers as if doctors had a vested interest in pasteurization. If our altruistic endeavours are to be constantly frustrated we shall have to go back to treating disease instead of preventing it. So will the dentists.

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The Edinburgh Letter

(From our own Correspondent)

A report recently issued by the Department of Health for Scotland shows that there was a 5 per cent decline in the incidence of sickness among persons insured under the National Health Insurance Scheme in Scotland in the year 1932 as compared with the previous year. The total period of lost time owing to certified sickness during the year amounted to over 16,700,000 days, representing a drop of 2.1 per cent compared with 1931. The most frequent causes of sickness were respiratory troubles, rheumatic conditions, digestive disorders, and accidents. The incidence of incapacity was highest in the industrial districts and lowest in the north and north-eastern areas, with the border districts intermediate.

The Department of Physical Education in Edinburgh University is doing a useful work in improving the physical condition of the students. One of its activities is an annual assault-at-arms, the proceeds of which are devoted to charitable objects. This event takes place next month in the graduation hall of the University. One of the items will show how cheaply the fittings of a gymnasium can be constructed. The equipment for this consists of eight barrels, costing six shillings each, and twenty sticks, costing tenpence each. The students will show how these simple properties can be used for a large number of gymnastic exercises. Women students will be prominent in this year's program, one of their chief exhibitions being Scandinavian exercises, while they will also give a display of Greek dancing. Lightning drill by members of the O.T.C., done to music without words of command, will be another feature, and there will be, in addition to other forms of fencing, a meeting between two Elizabethan "gangsters", each armed with a rapier and dagger. In the course of the program the "Loch Ness Monster", of which so much has been heard, will make its appearance.

At the Annual Dinner of the Glasgow and Aberdeen Universities North-East of England Club the Very Rev. Sir George Adam Smith, Principal of Aberdeen University, made reference to the remarkable increase in medical students at Aberdeen. Freshmen usually numbered from 40 to 70, but this year they had 99. He attributed the rise to the excellent quality of the instruction given throughout the medical course. He referred to a suggestion that had been made, that there was less thrift practised in the Scottish family in order to provide for the education of sons and daughters than hitherto. He wished to deny that, so far as the North of Scotland was concerned. His own experience showed that the people were as keenly devoted to the education of their families as they had ever been.

Dr. Ralph Stockman, Professor of Materia Medica, Glasgow, said he thought the time had come when some sort of tutorial system should be instituted at the Scottish Universities. He thought that a number of students did very little regular work during a considerable part of the session, and then studied feverishly when examination time drew near. The institution of a tutorial system would require the provision of greater accommodation, a larger staff, and more adequate equipment. He was convinced, as a result of his own experience, that there was definite need for the closer supervision of students in connection with their studies.

The system of school medical examination has been in operation in this country for about a quarter of a century. Its establishment marked the recognition of the value of a hygienic and preventive outlook on the health of children, and also showed that it was realized that health was of primary importance in enabling the children to benefit to the full from the education provided. The records show that in almost every respect, such as height, weight, incidence of sickness, and defects of various kinds, there had been a marked improvement. The general conclusion is that the average physical condition of the present school population, although falling short of ideal standards of physical perfection, compares very favourably with that of the children of past years. It cannot, of course, be claimed that this improvement is due entirely to the work of the school medical officer. Much of it is undoubtedly due to social progress, such as improved housing and nutrition and better environmental conditions generally. The study of these factors in relation to health should, however, afford a valuable contribution to biological knowledge. It is found that, while many of the ailments and defects disclosed are of a minor and curable nature, a small minority, approximately 4.5 per cent, may be classed as being more permanent in their effects. The school medical service does not provide treatment except in the case of necessitous children, when treatment is provided at the school clinics. The majority of the patients are advised to obtain private medical advice. Some parents, however, are careless; others hesitate to incur the necessary expense; and there can be no doubt that the organized provision of the services of a family doctor for certain classes of the population, such as the extension of the National Health Insurance Acts to include dependants, would do a great deal to prevent many of the defects which at present are only discovered when the child comes to be examined by the school medical officer.

R. W. CRAIG.

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Letters, Notes and Queries

A Doctor Saves a Mother With Placenta Prævia With His Own Blood

To the Editor:

Under the title "Hæmorrhage at the Outposts" in November, 1930,* the writer published a simple test for blood donors, in the hope that it might help that most loved member of our profession—the country doctor. This has drawn correspondence from Nova Scotia to British Columbia, and reports of at least twenty transfusions done with the test in remote homes, on kitchen tables, etc., have come to hand.

The most amazing account of a successful fight against rapid red death comes from Mountain Township, near Winchester, Ont. Dr. Harrison S. Gross had been carrying the sodium citrate necessary for an emergency transfusion. One night he was called out into the country and found a woman bleeding profusely, with the cord and edge of the placenta prolapsed. He delivered the child with forceps. The mother's condition was serious. By the light of a lamp and the use of the freezing test the husband's blood was found to clump markedly. Two brothers were then tested and both showed definite clumping. By this time the patient was pulseless. Dr. Gross knowing himself to be a universal donor dissolved the citrate in some raw well water, lay down on a couch, and with a large Unger needle drew a pint of blood from his arm. He got up at once and gave it to the patient. She recovered.

Recently the writer has simplified the freezing test still further by directing a slanting spray of ethyl chloride against the bottom of the blood-laden cover slip, obviating the necessity of inverting it. He would be interested in learning of any other transfusions with the ethyl chloride test.

NORMAN M. GUIOU.

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The Payment of Medical Fees

To the Editor:

After reading the letter from Dr. T. E. Brown, of Taber, Alta.,† I would like to ask if we are living up to our ideals when we admit that competition is necessary to keep up efficiency? Also if we scale down our fees by percentages, is our present scale fair? Is it worth a hundred dollars to take out an appendix and only three to five dollars for a thorough office examination and diagnosis? The present scale is too much inclined to make the rich richer and the poor poorer. Why should we fear socialization if we are allowed a fair living?

As regards the recognized indigents, one could still treat them if we had some system to collect from those who refuse to pay. The debt adjustment acts are our great troubles. As one who has spent twenty years in general practice on the prairie, I would like to be able to collect from those who can still buy gasoline for six and eight cylinder cars.

My money was not earned by doing major surgery in a hospital. Many times I have gone in a blizzard and endured frost-bites. Show me a way to collect even my expenses on those trips. "When the danger is over and all things righted, God is forgotten and the doctor slighted."

Hoping this will cause some thought.

M. H. W. FIZZELL.

Sylvan Lake, Alta.,
February 10, 1934.

* See this *Journal*, 1930, **23**: 679.

† See this *Journal*, 1934, **30**: 204.

Answers to questions appearing in this column should be sent to the Editor, 3640 University Street, Montreal.

Topics of Current Interest

Alpha-dinitrophenol—A Metabolic Stimulant

A year has elapsed since alpha-dinitrophenol was introduced into therapeutics as a metabolic stimulant by Tainter and his collaborators of the Stanford University School of Medicine. In experimental animals, large doses of this chemical increase the metabolism as much as 1,200 per cent,[1] thus generating more heat than the animal can eliminate and resulting in fatal fever. Smaller doses increase the metabolism proportionately, without, however, any apparent deleterious effects on vital functions. Fat and carbohydrates are burned in about equal proportions, with little if any effect on proteins. Particularly striking is a practically negligible effect on the circulation, in contrast to the pronounced effects on this function from equivalent doses of thyroid.

In patients, the drug stimulates metabolism similarly to the increases that occur in animals, with little or no symptoms following subfebrile doses.[2] This metabolic stimulation is useful in the treatment of obesity,[3] as shown by a fairly extensive series of cases. Particularly interesting is the fact that the drug appears to be effective regardless of the cause of the obesity, and even when the usual types of treatment are ineffective or inapplicable.[3] However, dinitrophenol cannot replace thyroid secretion when this is definitely lacking.

Considering the potency of the drug, few untoward results or accidents have been reported. One death has occurred, that of a physician who took a total of 9 Gm. in two doses, or about thirty ordinary daily doses.[4] His dying statements left no doubt that the drug was not taken

for therapeutic purposes, but probably with suicidal intent. The only definite side-action from the therapeutic use of the drug is a skin rash, which occurs in about one out of every fifteen cases.[3] The rash is uncomfortable for a few days and then disappears without sequelæ. Even in the hands of a group that reported one case in which there was an unusually severe rash,[5] the drug caused loss of weight in thirteen other cases in accordance with the general experience. No deleterious effects have been observed so far on the kidneys, but rather the contrary.[3] Likewise the liver appears not to be damaged.[3] True, one suspected case of liver injury has been reported,[6] but in this case the essential sign was a "jaundice," which, the physician failed to realize might be only the colour of the yellow dye he was administering. It is reassuring, therefore, that serious injury has not been demonstrated from therapeutic uses of this benzene derivative.

The introduction of dinitrophenol into therapeutics has aroused widespread interest in metabolic stimulants in general, and in substitutes for this drug, in particular. Already certain British workers[7] are proceeding to test the therapeutic actions of a related cresol. From the limited evidence available, the British drug appears to be more cumulative than dinitrophenol and not to be as well tolerated in high doses. Its general order of activity is not, however, greatly different. No information is at hand on the frequency of undesirable effects from this cresol, nor is its clinical toxicity or efficiency established. Therefore the dinitrocresol is still in the experimental stage and not ready for general therapeutic use. In contrast, the past year's experience with dinitrophenol has shown it apparently to be a relatively safe and reliable metabolic stimulant with which the practitioner may obtain therapeutic results. This does not mean that dinitrophenol should be given to every obese patient. In those cases in which diet has failed and thyroid is either not needed or not tolerated, dinitrophenol may be used with good prospects of benefit. However, as pointed out in the preliminary report of the Council on Pharmacy and Chemistry,[8] this agent must be used only under carefully controlled conditions and with due regard for the possibility that more extensive use may bring to light as yet unsuspected toxic effect. Particularly, patients should be cautioned of the dangers of overdosage; its indiscriminate use by the public will undoubtedly lead to serious accidents.—Edit. *J. Am. M. Ass.*, 1934, **101**: 542.

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The Dosage of Barbiturates

Dr. Eric A. Freywirth in the *British Medical Journal* (1934, **1**: 304) writes, "A few days ago I read a report of an inquest on a victim of dial. During the inquest several medical witnesses gave evidence and were questioned by the coroner on the toxicity of various barbiturates, including dial. One—according to the daily paper's report—replied that the fatal dose of barbitone (veronal) is about 50 grains, and that the same holds good for dial.

"I hope this is the inaccuracy of a reporter, and not the actual statement of the medical man concerned, for it is obvious that it is a misstatement in the above form. Dial—the allyl derivative of barbituric acid—is at the very least twice as toxic as veronal, and in my opinion more than that. The fact that it is sold in tablets of 0.1 gram or 1½ grains, against the 5 grains of veronal and sulphonal, shows that the average dose is one-third of that of the two simpler compounds. I have personal experience on this subject, having seen a case of dial poisoning where 20 grains were taken, and the patient's life was saved only by the narrowest margin imaginable, and, indeed, was given up by two consultants. In another case—an adult woman—16 grains were fatal after forty-eight hours.

"May I appeal on this occasion to those colleagues who have to prescribe—or dispense—these dangerous drugs, never, never, to prescribe them in tablets and in bulk, but to make an invariable rule, as I do, to prescribe them in divided powders and in combination with pulv. ipecac. and sacch. lactis, like:

℞ Diali ..... gr. jss	*or* ℞ Phenobarb. sod. . gr. jss
Pulv. ipecac. .. gr. iij	Pulv. ipecac. ... gr. ij
Sacch. lact. ... gr. v	Pulv. glycyrrhiz. gr. iv
f. pv., nocte s., si op. sit.	f. pv., nocte s.

"This combination will have very salutary effects on anyone taking, say, five of these powders, before the soporific has been absorbed in large quantities. Perhaps one of these powders could be included in the *B.P.* as pulv. phenobarb. co., in which case it could be easily prescribed in suitable cases."

Epilepsy and Tapeworm

Convincing proof that many cases diagnosed as true epilepsy are actually cases of infestation with tapeworm larvæ was presented to the Royal Society of Tropical Medicine in London by Colonel W. P. MacArthur, professor of tropical medicine at the Royal Army Medical College and consulting physician to the British Army.

The epileptic seizures are due to invasion of the brain by the eggs of the tapeworm, which form small, cyst-like masses called cysticerci, and particularly to the degeneration of these parasites after they have died. Colonel MacArthur has found as many as two hundred cysticerci in some brains.

Investigating the occurrence of epilepsy among soldiers, he found over sixty definite cases of infestation with cysticerci. Twenty such cases have been diagnosed in hospitals during 1933. Six of eight soldiers recently invalided from India and victims of cysticercosis had been certified as cases of true epilepsy. These cases of cysticercosis have no symptoms to distinguish them from ordinary epilepsy.

Cases of cysticercosis had been wrongly diagnosed as acute mania, melancholia, delusional insanity, dementia, brain tumours, and the nervous disease, disseminated sclerosis.

Colonel MacArthur believes that in England many persons in civil life who have been classed as hereditarily insane are suffering from cysticercosis acquired during residence abroad.—From *The Diplomate*, 1934, **6**: 68.

The Jargon of Science

"The Jargon of Science" was the subject discussed at one of the weekly dinners of the Authors' Club, London, held on October 23, 1933.

The guest of the evening was Dr. Francis Aveling, Professor of Psychology at London University, whose address to the psychology section of the British Association caused so much criticism by reason of the language in which it was couched. Sir Banister Fletcher, who presided, produced a cutting from *The Daily Telegraph*. "Here," he said, "are some of the headlines in one of the leading daily papers following Dr. Aveling's address:"

" 'New Jargon of Science,' 'Veterans Unable to Follow It,' 'Younger School Blamed,' 'Obscuring Their Thought.'

"Many of us use technical language," he went on, "some of it strong, and some of it of the milder variety. As a technical man, I do not know how we could do without technical language."

Dr. Aveling said: "I suppose I was invited to speak on the topic because of the complaint made at the British Association meeting this year that some of the communications of the younger men were couched in terms so obscure and befogging that many, even of the older men of science, were unable to understand them. Also, because, for no reason very obvious to myself, a paragraph taken from my presidential address to the psychology section became the subject of a brief correspondence, in part ponderous and in part exceedingly witty, which was printed in *The Daily Telegraph* under the heading "Scientific Jargon."

Many questions were very difficult to answer in any language, to say nothing of simple, non-technical terms. One question led to another. It was a case of probing a little further and going deeper into the mysteries of matter and mind. All this questioning and answering must be translated into symbols of thought if we were to communicate with one another.

"The more simply we put things the better, but it is not always possible to use basic language. In psychology, for instance, new ideas are coming forward and new terms are being devised. It is necessary to know a series of extraordinary terms with extraordinary conceptions behind them, and it is very perplexing, even for the psychologist. But the psychologist does not willingly tyrannize."

Among authors it was hardly necessary to stress the advantage of a copious, flexible vocabulary. Sir Bannister was quite sure that those who, like authors, did creative work would not agree to have their vocabulary shorn of even a single word. "That is true of you, who are authors, and who make your characters dance to your tune and in a setting you have created. How much more true must it be in the realm of science where, trying to be accurate observers and classifiers, makers and testers of explanatory theories, and systematizers in the different fields of knowledge, we must allow the immense complexity of inter-related detail which is Nature to dictate to us, so that we can grasp what we may of it in human thought and translate it into words. The ordinary words in current use are not enough for us. We must be allowed to coin new ones, borrowing for the most part from Greek and Latin roots to mint afresh for our needs, and to put them into circulation again. We must be allowed to name newly-found plants, or comets, or waves, or layers of ether, after their discoverers. For the sake of exactness we must be allowed to invent a terminology like that of chemistry, or a symbolic notation such as those of mathematics or statistics.

"It may be true that less technical language might be used in the objective sciences—those which deal with the external world—it is not so clearly true of the subjective sciences, as, for instance, psychology. A vast amount of work has been done in the field of psychopathology, as a result of which many new technical terms have been introduced into psychology; and, unfortunately, with a total lack of precision and

propriety, have filtered into every-day usage. The 'unconscious,' 'repression', 'transference,' 'conflict,' 'Œdipus complex,' and the like are cases in point. On the lips of the laymen they are, as a rule, inappropriate, inaccurate, and do constitute a quasi-scientific jargon. Used in their proper sense and in their proper context, which is psychopathology, they are both appropriate and exact.''—*The Daily Telegraph*, London, October 24, 1933.

Abstracts from Current Literature

Medicine

The Evolution of Tuberculosis in the Human Lung. Stewart, C. A., *Am. J. M. Sc.*, 1933, **185**: 346.

The opinions expressed in Stewart's summary are based upon data from 1687 children with some form of tuberculosis observed in the Lymanhurst School for Tuberculous Children in Minneapolis. Primary tuberculous infections of the lung occurring at any age in life uniformly resolve and calcify. Roentgenological studies show these healed lesions as calcified hilus glands or as Ghon tubercles—healed areas in the parenchyma of the lung. If the initial infection is extensive symptoms of varying intensity are produced, which subside, however, in the course of a few to several weeks. These initial lesions usually occur during childhood, but may occur at any age. This primary infection is known as the primary complex and can occur only once. Thereafter the individual reacts differently to a second infection. He demonstrates less resistance to the infection than before the primary complex. The lesions of reinfection—the adult type of tuberculosis or phthisis—usually appear in the subapical portions of the lungs. These lesions may also occur in childhood, but remain dormant for months and years without producing symptoms or physical findings. During the ''teens'', often about puberty, previously dormant lesions characteristic of the adult type of tuberculosis frequently tend to spread, produce cavities, and cause death. These lesions in contradistinction to the primary complex seldom calcify. The relationship existing between the childhood and the adult type of tuberculosis seems to consist largely in the tendency of the primary infection to prepare the patient for the development of phthisis should he perchance later experience a reinfection of sufficient severity to produce an intrapulmonary lesion. Adult tuberculosis is almost invariably dependent upon the changes in the reaction of the individual to the tubercle bacillus which result from the first infection, and is in no way dependent upon a lighting up of the old disease acquired during childhood.

E. S. MILLS

Incidence of Rheumatic Fever in New York City Hospitals. Davis, Jr., J. S. *Am. J. M. Sc.*, 1933, **186**: 180.

Davis has made a statistical study of the incidence of acute rheumatic fever at St. Luke's Hospital, New York, and the New York Post-Graduate Hospital from 1897 to the present time. The study shows that there has been a steady decline in the incidence of the disease up to the year 1919; since then there has been an appreciable rise. However, in spite of this increase in the disease the cases have been of a much milder type. This is shown in two ways. Plotting the cases with a temperature of 104° F. and over from 1897 to 1931 yields an incidence curve which rises steadily to the year 1920, since which time it has fallen sharply. In 1920 over 30 per cent of the cases admitted had a temperature of 104° F. or over during the course of the disease, whereas in 1928 it had fallen to about 12 per cent of all cases. The decrease in severity of the infection may be further demonstrated by considering the mortality rate. The death rate per 100,000 population from this disease was 7.8 in 1911; in 1920 it was almost one-half, 4.5; and in 1931 it was only about 2.8.

The author recognizes four possible factors with reference to this changing incidence: (1) removal of foci of infection; (2) cycles in the virulence of infectious diseases; (3) rainfall; (4) general economic conditions. As regards the first, the statistics gathered do not permit of the statement that the removal of foci of infection has any significant effect on the incidence of rheumatic fever. As regards the second factor, the cyclical character of the disease, a comparison of the death rate from rheumatic fever with that from other infections as scarlet fever, septicæmia, and erysipelas shows that all exhibit a marked decline in mortality. This may be due to improving hygienic conditions rather than to changing virulence of the disease. From a comparison of rainfall and incidence of acute rheumatic fever the author concluded that wet weather was one of the factors increasing the prevalence of the disease in the past decade. As regards the fourth factor no conclusions were warranted.

E. S. MILLS

''Bornholm Disease.'' An Account of a Yorkshire Outbreak. Pickles, W. N., *Brit. M. J.*, 1933, **2**: 817.

This interesting infectious malady is very common in Scandinavia, where it is known by the above name, after the island of Bornholm in the Baltic, a frequent nidus of the disease.

It was first described by Dabney in the United States in 1888, who tentatively suggested that it was a form of dengue and noted that its local name was "devil's grip". Payne and Armstrong named it in 1923 "Epidemic transient diaphragmatic spasm", while in 1924, other authors described epidemics in United States under the title "Epidemic pleurisy". Sylvest, of Copenhagen, considers it due to inflammatory infiltration of the muscles and calls it "Myositis acuta epidemica". There were 3,000 cases in Copenhagen during 1930.

The present outbreak is the only one described, to date, in England. It consisted of 6 cases, 5 children and 1 adult. The source of infection was a little girl from the York neighbourhood, but no similar cases have been traced to this source.

The character of the symptoms was as follows: onset with very acute upper abdominal pain, occurring in spasms, with pyrexia to 103° and sweating. The xiphisternum is pointed to as the location of the pain. The respirations are rapid, shallow and exceedingly painful. There is pain on yawning and on deep breathing, between the spasms. No abnormal signs are found in the chest. The fever rapidly subsides, but tends to recur on the third day, together with return of pain. There is no vomiting, diarrhœa, or rash. The fauces are not congested; the tongue is coated. One patient showed nasal catarrh and another conjunctivitis. Recovery occurred rapidly — in four to six days, and there were no sequelæ.

W. FORD CONNELL

Surgery

Observations on Surgical Diseases of the Biliary Tract. Wilkie, D. P. D., *Brit. M. J.*, 1933, **2**: 767.

Biliary disease appears to start in the gall bladder; the ducts are affected secondarily. Single cholesterol stones and multiple pure pigment stones may form as a result of disordered metabolism, independently of recognizable infection. Eventually infection is superadded, especially if the cystic duct becomes occluded by a stone.

Infection of the gall bladder is very common, and is often followed by gall-stone formation. Infection is intramural; it is probably hæmatogenous. Streptococci, *B. coli*, and *B. welchii* appear to have a predilection for the gall bladder, and in the order named.

Many complications may result from gall-bladder disease. Empyema of the gall bladder, arrest of a stone in the common duct, carcinoma of the gall-bladder, and intestinal obstruction from stone are among these. The author has encountered carcinoma 31 times in 987 operations on the biliary tract; stones were present in each case. Many complications result from infection. Chronic pancreatitis, hepatic cirrhosis, toxic effects on the myocardium, joints, intermuscular fibrous tissues, and kidneys are among these. Proof of this is obtained from the striking improvement noted in a large number of cases following the removal of a chronically infected gall bladder.

Surgery of the gall-bladder may have one or more of three main indications: (1) for relief of local symptoms; (2) to remove a focus of infection; (3) to remove a diseased organ which is potentially malignant.

Typical biliary colic offers little difficulty in diagnosis. An intolerance of cooked fats, an ache in the region of the right shoulder blade, definite subcostal tenderness, a tender spot over the 9th intercostal nerve in the scapular line, and chronic flatulent dyspepsia indicate chronic infection of the gall bladder. In the female duodenal ulcer may simulate biliary disease. A dye test, plus a barium meal, may modify the original diagnosis. Occasionally the appendix, gall bladder, and duodenum in the same patient are diseased.

Recurring biliary colic is the most frequent incentive to seek relief. If this is the only symptom radiological investigation should be done prior to operation. Operation should be considered in the chronic dyspepsias showing evidence of gall-bladder disease.

Obstruction to the outlet of an infected gall bladder results in fever, dirty tongue, a catch in the breathing, a rigid and tender upper right quadrant of the abdomen, and a faint icteric tinge. After the acute symptoms have subsided, usually in 7 to 10 days, cholecystectomy should be done. If the patient is elderly, and if symptoms show no sign of subsiding within 48 hours, operation should not be delayed. Here the obstructing stone should be removed and drainage established.

Stone in the common duct gives rise to a variable picture. Recurring colic, chills, jaundice, and loss of weight make the diagnosis easy. Some patients never have had colic; jaundice may never have been noticed; or vague discomfort plus loss of weight may be all that was noticed. Operation should be advised where there is a reasonable suspicion of stone in the common duct. Delay leads to serious damage to the liver and pancreas. In all operations on the biliary system, except in emergencies, the common duct should be exposed. If it be dilated or thickened, aspiration followed by exploration should be done.

Preparatory treatment is imperative for safe biliary surgery. In the stout a three-months' course of dieting and outdoor exercise will lower the weight and increase tone. Dental sepsis should be removed. If cholangitis is present urotropin is used to diminish infection. Moderate jaundice following a chill or fever should be allowed to clear, the time being spent

on restoring body fluid and supplying glucose. There is little danger of hæmorrhage following operation in a case of waning jaundice. If jaundice is progressive fluid and glucose, preliminary injections of calcium chloride and sodium citrate, and a blood transfusion are indicated.

The best anæsthetic, in the author's experience, is gas and oxygen, supplemented by ether, and combined with local anæsthesia of the abdominal wall. Cholecystectomy is the operation of choice.

The cystic duct and artery should be ligated separately. Most common duct stones can safely be removed by forceps through an opening in the supra-duodenal portion of the duct. If the common duct contains white bile simple drainage only should be done. Drainage of the duct should be done in all cases where a stone has been removed. Marked thickening of the head of the pancreas, plus a bile-containing gall bladder whose walls are not sclerosed, indicates the advisability of anastomosing the gall bladder to the duodenum, after draining the common duct.

Any tendency to capillary oozing postoperatively is best treated with small repeated blood transfusions and by calcium chloride. Active movements of the limbs should be encouraged from the day of operation.

The death rate depends on the presence of complicating factors, on the care in selection and preparation of patients, on gentle handling, and the avoidance of injury to adjacent structures.

Cholecystectomy gave good results in 70 per cent of the author's cases. Generally, the grosser the lesion, the better the operative result. Flatulence and intolerance to cooked fats remained in 20 per cent. STUART GORDON

Therapeutic Considerations in the Management of Acute Intestinal Obstruction. Wangensteen, O. H., *Arch. Surg.*, 1933, **26**: 933.

The persistently high mortality attending the surgical relief of acute intestinal obstruction reflects only too plainly the effects of late diagnosis. Among the causes of delayed diagnosis are: (1) failure to appreciate that simple obstruction of the bowel is not accompanied by tenderness or rigidity of the abdominal wall; (2) a belief that the expulsion of gas or fæces with an enema militates against obstruction of the bowel; (3) assuaging the pain with morphine.

Local tenderness and rigidity of the abdominal wall are almost invariably present in the strangulation type of obstruction, due to the escape of hæmorrhagic fluid into the peritoneal cavity. The strangulation varieties of intestinal obstruction should be dealt with surgically without delay, because of the threatened devitalization of the obstructed bowel. Pre-operatively, 2 or 3 litres of normal saline solution should be given intravenously or subcutaneously. Blood transfusion is of value in the simple type; but only in the strangulation types of obstruction, where loss of blood is a significant factor, is transfusion urgently needed, especially where there is a high pulse rate and a low blood pressure.

The author has long employed suction drainage by a nasal catheter in cases of functional spastic ileus, which suffices to decompress the bowel. He cites a number of cases where this method has been used successfully without operation. He describes his method of enterostomy.

G. E. LEARMONTH

Duodenal Ileus. Shapiro, P. F. and Kasabach, H. H., *Arch. Surg.*, 1933, **26**: 1084.

One of the most frequent manifestations of duodenal ileus is a symptom-complex which simulates disease of the gall bladder. Infection of the biliary tract is of frequent occurrence, associated with duodenal ileus.

The authors have attempted experimentally to reproduce the conditions of duodenal ileus, to alter duodenal tonus and motility, and to study the changes which these might produce in the evacuation mechanism of the gall bladder. There has been a diversity of opinion regarding the rôle of the duodenum in the control of biliary outflow. Owing to the length and obliquity of insertion of the common bile duct in the substance of the duodenal musculature, the waves of duodenal peristalsis, sweeping downward, are said to exert an important milking action on biliary flow. The discharge of bile is completed by aspiration, due to the reduced pressure in the duodenum, which follows each peristaltic wave.

Shapiro and Kasabach, in their experimental work, reversed a 40 cm. portion of small intestine in a small dog, beginning proximately quite close to the ligament of Treitz. The segment represented a considerable portion of the entire small intestine. Ten days after operation fluoroscopy revealed the duodenum to be fully twice its pre-operative diameter. The gastric emptying time was increased by three and a half hours. The meal remained in the dilated duodenum for fully one half-hour after the stomach was empty. Duodenal peristalsis was markedly exaggerated. More constant results were obtained in producing chronic duodenal obstruction by the flap method of Berg and Jobling, and with more striking results. As a result of their experiments they concluded that there is a definite increase in the evacuation time of the gall bladder. The late results when ileus persisted were inconstant, as in some dogs the delay in the evacuation of the gall-bladder persisted; in others, the emptying time of the

gall bladder returned to normal, which results are in keeping with the clinical variability of biliary involvement, in duodenal ileus.

G. E. LEARMONTH

Obstetrics and Gynæcology

End Results in the Treatment of Pelvic Infection. Aldridge, A. H., *Am. J. Obst. & Gyn.*, 1933, **26**: 705.

Adnexal disease tends to heal spontaneously. There is no means of knowing which cases will heal and which may need operation. All cases should therefore have the benefit of conscientious palliative treatment before operation is considered. In the series of 1,021 patients treated by palliative methods approximately one-half (48 per cent) either healed completely or became free from symptoms so that operation was not necessary. One-third (32.7 per cent) persisted after treatment with symptoms and palpable disturbance. Some of these latter patients had to be operated upon, as their symptoms could not otherwise be relieved. Approximately one-fifth (19.1 per cent) of the patients treated were never examined after being discharged from the hospital.

Operation for salpingitis is recommended in the chronic stage if palliative treatment has failed to relieve symptoms, and for the disability of attacks which tend to recur in spite of treatment. The practice of operating to cure salpingitis in the acute stage of the infection is absolutely condemned. Nearly one-half of such operations are unnecessary, if cases are first treated by palliative means. Furthermore, patients operated upon in the acute stage are subjected to unjustifiable mortality and morbidity, unnecessarily destructive surgery, and to too high a percentage of unsatisfactory end-results. Operations in the chronic stage, even after recurrent attacks of infection, yield end-results which justify the greatest conservatism in the management of salpingitis.

ROSS MITCHELL

The Treatment of Prolapsus Uteri, with Special Reference to the Manchester Operation of Colporrhaphy. Shaw, W. F., *Am. J. Obst. & Gyn.*, 1933, **26**: 817.

In Manchester for a continuous period of 45 years one type of operation, always with the same general principles though with varying minor technical details, has been performed by a large number of gynæcologists upon all patients with prolapsus uteri, irrespective of age, social position, or parity. The results allow more nearly a guarantee of cure to be given to the patient beforehand than does any other operation performed in surgery.

In 1888 Donald, of Manchester, began to treat cases of prolapse by the combined operation of anterior and posterior colporrhaphy and amputation of the cervix. So good were his results that his colleagues gradually adopted this procedure, and by 1904 every member of the staff of St. Mary's Hospital, Manchester, had followed his lead. Shaw's opinion is that this is the best method of treatment for all cases of prolapsus uteri, whether the patient is young or old, parous or multiparous. In his series of 549 cases, 529 (95.35 per cent) were cured. This operation is not a cause of trouble in subsequent labours. The prolapse may recur after subsequent labours, but in less than 25 per cent of cases. It is necessary to combine an abdominal operation with the colporrhaphy only in those very rare cases where practically no muscular tissue is found in the pelvic floor. In this series it was used only upon two.

ROSS MITCHELL

Granulosa Cell Ovarian Tumours as a Cause of Precocious Puberty, with a Report of 3 Cases. Novak, E., *Am. J. Obst. & Gyn.*, 1933, **26**: 505.

This neoplasm develops from granulosa "cell rests" left over from the formation of the follicular apparatus. The constituent cells retain their physiological function. Granulosa cell tumours occur most often in elderly women and bring about more or less periodic bleeding. Only a few cases have been observed in children, and here the symptoms are even more striking than in older women where sex characters are already well established. The important rôle of the female sex hormone in the differentiation of the female sex characters is now generally accepted. A great excess of this hormone in the young child would be expected to precipitate the changes commonly occurring at puberty, and this is exactly what occurs.

Three cases are reported in girls of three years eleven months, five years, and six years respectively. The breasts showed marked hypertrophy, axillary and pubic hair appeared, the external genitalia assumed the pubertal type, and menstruation occurred regularly. In each case the ovarian neoplasm was removed and the diagnosis of granulosa cell tumour established on microscopic examination of the sections, and also, in each case, there was recession of the abnormal manifestations after removal of the growth. While granulosa cell tumours are commonly classed as carcinomas, their degree of malignancy is usually slight, so that recurrence after removal occurs rather infrequently. The periodic uterine bleeding in connection with these tumours occurs without the agency of ovulation or corpora lutea and is apparently to be explained altogether by fluctuations in the folliculin level.

ROSS MITCHELL

Pædiatrics

Rheumatic Heart Disease in Children. Proceedings of American Academy of Pædiatrics, June 12, 1933. Round Table Conference, *J. of Pædiat.*, 1933, **3**: 654.

The following definition of the rheumatic state was presented. An antigen (toxin) formed by recurring infection in one or more areas of the body (sore throats, common colds) and operating in an injured host (malnutrition) produces fixed (proliferative) and/or wandering (exudative) tissue response in various susceptible parts of the body. These changes may occur in many parts of the body but principally in certain parts. (a) The nasopharyngitis is regarded as the initiatory cause of the attack and serves as a focus from which the antigen is liberated. (b) With the exception of pains in the legs due to fatigue, coming on at night and described as a soreness of the legs and not of the joints, there are almost no pains in the extremities in childhood that are not due to rheumatism. (c) "Carditis" best describes the heart lesion, for the endocardium and myocardium are always involved and sooner or later the pericardium will show changes. (d) Chorea, frequently found with rheumatic manifestations, is being looked upon more and more as a specific type of toxic encephalitis affecting particularly the lower basal nuclei. (e) The relation to nephritis is not clear, but children with rheumatic heart disease show some form of nephritis more frequently than a normal group. (f) Pathologists have, in recent years, emphasized the lesions in the lungs, pleura and peritoneum, which resemble closely Aschoff bodies.

The age when the first attack of rheumatic infection occurs determines largely the manifestations of the disease. In childhood the infection tends to be widespread throughout the body and involve all parts of the heart, whereas in adult life joint pains play a more prominent part and the condition is more localized to one tissue. Cases of rheumatic fever of the adult type in childhood frequently show other signs of biological maturity and growth. It is suggested that the presence of progressive or regressive growth is important in determining the manifestations of the disease. Race seems to be less of a factor than location, climate, and living conditions, though the disease is not frequent in northern China or in the south temperate zone. The social status with its associated bad housing, frequent infection, close contacts with bacterial carriers, and improper care during minor illnesses has been shown to be one of the largest factors influencing the disease's incidence and manifestations.

ALAN ROSS

So-Called "Thymic Death". Waldbott, G. L., *Am. J. Dis. Child.*, 1934, **47**: 41.

Of a group of 102 cases in which the diagnosis of status thymicolymphaticus was made by various pathologists 34 only were selected by the author in which no adequate cause of death had been found. The remaining 68 were excluded, since other conditions, such as hyperthyroidism, birth trauma, gastro-enteritis, and respiratory infections were associated with lymphoid hyperplasia and in themselves were sufficient to cause death. In 11 of the 34 cases death occurred without previous illness, nor were there any pathological findings to indicate the presence of a previous illness. In 16 minor illnesses preceded death, while in 7 a syndrome developed manifesting dyspnœa, stridor, fever and shock.

The following characteristic pathological findings were noted. The lungs showed capillary congestion, extravasation of blood cells and œdematous fluid, alternating with areas of emphysema and atelectasis. Petechial hæmorrhages in the heart, pleura, lymph glands, and various other viscera were present in most cases. The heart showed right-sided dilatation. The liver showed degenerative changes, while œdema and capillary congestion were frequently seen in other organs besides the lungs. The suprarenals showed marked hypoplasia and all lymphoid tissue was markedly hyperplastic.

The findings in cases of anaphylactic shock are in close agreement with these changes. The lungs show the same picture exactly, and hyperplasia of the lymphoid tissue, petechial hæmorrhages, and dilatation of the right side of the heart occur almost invariably in anaphylactic shock. Eosinophilia of the tissues and an allergic family or personal history in the thymic cases points also towards the conception of the identity of the two conditions.

On the basis of these findings it is believed that death in status thymicolymphaticus may be the result of a primary anaphylactic œdema of the lungs and ensuing asphyxiation. This belief requires the assumptions that anaphylactic shock may occur from the incorporation into the body of non-protein substances and that absorption of shock-producing antigen may take place by ways other than injection. The author presents evidence from his own experience and from work of others to show that both these assumptions are confirmed facts.

GUY H. FISK

Therapeutics

The Management of Œdema. Elliott, C. A., *Ann. of Int. Med.*, 1933, **7**: 240.

The functional reserve of the kidneys is so great that sufficient renal function is usually preserved to carry on adequate excretion of water, even in the presence of gross kidney

damage. Water, taken in ordinary amounts, serves as an excellent diuretic, and restriction of water intake, save under unusual conditions, does not contribute to the relief of œdema. In the presence of failing circulation with increased hydrostatic and filtration pressure, œdema appears to be due not only to mechanical interference in circulation, but also, in part at least, to interference with peripheral cellular physiological processes such as $O\text{-}CO_2$ exchange. Rest in bed, digitalis and O_2 therapy are indicated in œdema of this type.

The serum proteins appear to be of *first* importance in maintaining the osmotic equilibrium between the cellular elements and fluids of the body. Depletion of the serum proteins occurs clinically as the result of protein restriction in diet, protein waste as in albuminuria, or as the result of disturbed metabolic processes such as hyperthyroidism or diabetes. Depletion of serum protein automatically raises the concentration of the total base.

Disturbances of the acid-base equilibrium of the serum are probably of *second* importance in determining the state of hydration of the body. As sodium makes up more than 90 per cent of the total base of the blood serum, sodium chloride plays a very important part in this equilibrium. About six grams of salt will hold about one litre of water. Procedures which tend to shift the reaction of the tissues and extracellular fluids toward the acid side result in the excretion of base, and, with it, water. This is readily accomplished by a low salt diet, and the administration of an acid-liberating substance such as ammonium chloride, ammonium nitrate, calcium chloride, or hydrochloric acid in sufficient quantity, or by prescribing a diet that leaves a definitely acid ash. The results may, on occasion, be greatly enhanced by the intravenous or intramuscular injection of one or two cubic centimetres of the organic mercurial preparation salyrgan. It would appear that mercury has a general specific action on the colloids of the body as well as a local effect upon the tubular epithelium of the kidney.

H. GODFREY BIRD

Acetyl - B - Methylcholin. III. Its Action on Paroxysmal Tachycardia and Peripheral Vascular Disease, with a Discussion of its Action in other Conditions. Starr, Jr., I., *Am. J. M. Sc.*, 1933, **186**: 330.

This is one of a series of papers on the pharmacological effect of acetyl - B - methylcholin. It deals chiefly with its application in clinical medicine. The effect of a subcutaneous injection of from 5 to 25 mg. of the drug on a normal person was to cause, within a minute after injection, flushing of the face and neck, generalized sweating, salivation, slight fall of blood pressure, increase in pulse rate, and increase in the depth of the respirations. Complete recovery occurs in 15 to 20 minutes. When given in doses of from 50 to 500 mg. the drug's action was more insidious, beginning in from 15 to 75 minutes after injection. The duration of the symptoms depended on the dosage. With this method of administration the gastro-intestinal effects overshadowed secretory and cardiovascular activity. The most noticeable effects were relief of distension, increase in gastric secretion, and a comfortable laxative effect.

The drug has been used successfully in terminating immediately attacks of paroxysmal tachycardia of auricular or supraventricular type, frequently after carotid pressure failed. It may also be used in improving headache and vertigo due to spasm of cerebral vessels. When taken by mouth the drug relaxes the vascular spasm of Raynaud's disease. The attack following exposure to cold may be prevented or completely relieved by the drug. It also causes a rise in the skin temperature of the feet in cases of thromboangeitis obliterans, and may relieve pain in cases of suspected gangrene from peripheral vascular disease.

E. S. MILLS

The Comparative Value of Drugs used in the Continuous Treatment of Angina Pectoris. Evans, W. and Hoyle, C., *Quart. J. of Med.*, 1933, **2**: 311.

There being at present no agreement on the best routine treatment of angina pectoris by drugs, the authors attempted to evaluate those most commonly recommended. To do this, they observed a series of 90 cases of the angina of effort over a period of 2½ years, paying particular attention to the comparative value of the various drugs, used in continuous treatment for periods of 2 to 4 weeks at a time, or longer. As a control in each case a placebo was regularly substituted for the active drug. The following were tested: sodium nitrite, mannitol hexanitrate, erythrol tetranitrate, potassium iodide, luminal, chloral, morphine, papaverine, phenacetine, diuretin, euphyllin, belladonna, digitalis, lacarnol and harmol. Their careful results show that a certain measure of improvement is obtained from every drug tried, but at least as great an improvement during treatment with placebo. This result can only be explained by natural variations in the severity of the symptoms, giving a spurious value to each remedy. Though not convincing, there was some slight reason to think that chloral, morphine, papaverine and phenacetin had a trifling influence in controlling the group incidence and severity of attacks. The authors were unable to convince themselves that any of the drugs tested were worthy of trial in the routine treatment of the disease. Since none of these remedies appears

capable of lessening the frequency or severity of the anginal attacks, the authors point out that there is all the greater need for a study of the application of the general measures known to control them and to promote the wider use of vasodilators, such as trinitrin, to be used during the attacks. W. FORD CONNELL

Radiology and Physiotherapy

The Interpretation of the Triangular Basal Shadows in Roentgenograms of the Chest. Richards, G. E., *Am. J. of Roentgenol.*, 1933, **30**: 289.

Singer and Graham in 1926 called attention to this condition, calling it an atelectatic lower lobe, a phase of bronchiectasis, and verified their observations at operation. Nitsch and Sante refer to it, but until recently English literature has been rather silent. The author has encountered this finding 10 times in 2,000 consecutive chest examinations.

The triangular basal shadows may be typically unilateral or bilateral. These shadows are often indifferently seen on ordinary chest films, but the use of iodized oil shows that the area involved represents the whole of the lower lobe of the lung affected, as may be seen by careful study of the distribution of the bronchial trunks. It is remarkable to note the small space occupied by an entire lobe when collapsed in this manner. In one case this area simulates an old abscess, as in Pott's disease—only to be differentiated by the aid of lipiodol. Authorities are quoted who hold that this condition arises only in collapsed accessory lobes, stating at the same time that these accessory lobes are present complete or in part in 15 to 45 per cent of all human lungs.

The second point of unusual interest is the amount of downward rotation of the bronchi to permit the collapse of a lobe into so small a space, and the corresponding expansion of the remaining lung to fill the thoracic space. Differential diagnosis, according to the author, makes the use of some opaque medium almost essential. The finding of such shadows in chest films is pathognomonic of atelectasis with bronchiectasis. This may occur in accessory lobes as stated by other authors, but also it commonly involves entire lobes of lungs.

A. STANLEY KIRKLAND

Calcification in the Aortic and Mitral Valves. Sosman, M. C. and Wosika, P. H., *Am. J. of Roentgenol.*, 1933, **30**: 328.

In a very thorough-going way these authors present 23 cases, demonstrated *in vivo* by the roentgen ray. It is pointed out that one sees only what one looks for and that the old excuse of indifferent apparatus does not hold, because these cases have been demonstrated by using the apparatus found in many present-day laboratories. A historical review is followed by a clinical review of the cases with statistical records. Etiology and pathology are presented with references to the literature. The technique of roentgenoscopy and roentgenography is described in sufficient detail. Much stress is laid on fluoroscopy, for which long preparation of the eyes is necessary, plus a slightly higher degree of penetration and the use of a restricted aperture. With these three precautions, it is easy to locate the auriculo-ventricular junction on the left border of the heart, and then search the region below and medial to this, looking for dark areas which show a dancing movement. For fuller details, the article must be carefully read. Films are only used to check the amount and distribution of calcification and to furnish a permanent record for demonstration. Case histories are summarized. In conclusion, it is stated that calcification of the heart valves may be demonstrated by x-ray during life, and that aortic stenosis with calcification is a common finding in older patients. Calcification in the mitral valve leaflets is accompanied by definite signs of mitral stenosis. Calcification in the annulus fibrosus of the mitral valve, at least, may be entirely unrelated to disease of the cusps and produce no cardiac symptoms.

A. STANLEY KIRKLAND

Anæsthesia

Choice of Anæsthesia for Abdominal Operations. Sise, L. F., *Anæsthesia & Analgesia*, 1933, **12**: 216.

The prime requisite in an anæsthetic is safety and freedom from harmful effects. In abdominal operations the anæsthetic should also facilitate the operation by causing adequate muscular relaxation. To produce the relaxation desirable it may be necessary to push the anæsthetic to a degree which is dangerous or, at least, liable to be followed by undesirable after effects.

The Lahey Clinic recognizes three classes of patients: (1) the majority, who are in sufficiently good condition to have the benefit of complete muscular relaxation; (2) a much smaller group of patients capable of standing considerable relaxation at various stages in the operation; (3) a still smaller group where the condition of the patient is such that the most important thing is to conserve the vitality regardless of the relaxation secured.

Considering the various anæsthetics in turn, ether is useful for patients of the first class, combining as it does immediate safety with relaxation. However, the irritating odour and recognized harmful effects when used alone rule it out as the ideal anæsthetic. Regional anæsthesia is free from harmful effects, but the field of relaxation is not sufficiently extensive for abdominal surgery. It is useful for the third class of patient in such operations as enteros-

tomy, cholecystostomy, resuture of operative wounds, etc.

Gas anæsthesia (nitrous oxide) is free from harmful effects, but is powerless to produce relaxation sufficient for abdominal operations without carrying it to such an extreme depth that the element of danger is introduced. This refers of course to gas unsupported by ether, avertin, or regional. It is useful for patients in moderately good condition, requiring a simple operation, usually with exploration.

Spinal anæsthesia gives the most complete muscular relaxation of any of the anæsthetics, but it is also the most dangerous. It should be reserved for patients in good condition, *i.e.*, the first class. It is especially useful in intestinal obstruction and acute appendicitis.

By combining two or more anæsthetics one may get sufficient depth by the sum of their actions without any one being given in sufficient amount to produce its own deleterious effect. At the Lahey Clinic the following sequence is used: avertin—gas—regional anæsthesia—ether. The avertin is used as a basal anæsthetic only (usually 80 milligrams per kilo). The gas (nitrous oxide) is administered intratracheally because it affords better control of the depth of anæsthesia and facilitates rapid changing as indicated. It is used along with the carbon dioxide absorption apparatus which tends to promote quiet respiration and also diminishes the amount of gas used. Regional anæsthesia is given by the surgeon who infiltrates the recti muscles giving local muscular relaxation and reducing the amount of ether required. Ether is added, as indicated, usually for opening, exploration and closing. This combined anæsthesia is indicated for those patients of the second class whose condition does not warrant the employment of a spinal anæsthetic, but who are better risks than cases included in the third class. It is also useful in cases where the length of operation, especially in the upper abdomen, makes a spinal anæsthetic undesirable.

F. A. H. WILKINSON

Spinal Anæsthesia: Nervous System Sequelæ.
Hyslop, G. H., *Surg., Gyn. & Obst.*, 1933, **57**: 799.

Various writers, reporting on 2,074 administrations of spinal anæsthesia, describe nervous system sequelæ in 11 patients (0.5 per cent). Davis and his co-workers have shown that spinal anæsthetics have a hæmolytic action on the blood cells and a myelolytic effect on the tissues of the spinal cord. There is a meningeal reaction with plasma- and lymph-cell exudate not due to infection, and there are also degenerative changes in the grey and white substance. Spielmeyer records temporary anterior horn changes. Fibrotic scarring of the meninges has been noticed in animals killed 30 to 90 days after spinal anæsthesia, and Lindemulder describes comparable root, meningeal and cord reactions in a man dying 12 days after operation.

The author's classification of nervous system sequelæ is as follows.

1. *Local or neighbourhood.*—Due to the trauma of injection or the effect of the drug on nerve roots or nearby spinal cord tissue: (a) cauda equina lesions; (b) conus lesions; (c) myelitis (in the lower segments of the cord); (d) spinal claudication (Alba and Pla).

2. *Distal focal.*—Due to causes not yet determined: (a) cranial nerve; (b) brain and brain stem; (c) spinal cord.

3. *General.*—In which the entire nervous system is affected, with perhaps the greatest injury limited to certain areas or tissues: (a) headache and stiff neck, which occur in 6 per cent of cases; (b) infective meningitis due to infection during injection (9 times in 20 years); (c) encephalitis; (d) aseptic meningitis and meningo-encephalitis.

The cauda equina lesions of Group 1 are radicular in type, consisting of vesicular or herpetiform eruptions in the area supplied by the affected nerve root.

The lesions of Group 2, affecting the cranial nerves, consist of primary optic atrophy, extra-ocular muscular paralyses with the external rectus most frequently involved, and nystagmus, usually of a transient nature. The brain and brain-stem lesions are represented by 3 cases of hemiplegia occurring after operation. Spinal-cord lesions include a case of diffuse and ascending hæmorrhagic myelitis, one of Brown-Séquard syndrome, and a brachial nerve involvement.

The author concludes that certain sequelæ may follow spinal anæsthesia. Trauma from the injecting needle, accidental infection during the injection, and the effect of the drug on the tissues may account for some cases. There is no evidence that any of the drugs used predispose to nervous system sequelæ, except that ocular paralyses occur more frequently after stovaine than novocaine. The hæmolytic and myelolytic action described by Davis justifies drainage of the spinal fluid after operation. Finally, there should be a cytological and chemical study of the spinal fluid a week after operation which might serve to throw some light on the cause of delayed sequelæ.

F. A. H. WILKINSON

Hygiene and Public Health

The Physiological Response of the Peritoneal Tissue to Dusts Introduced as Foreign Bodies.
Miller, J. W. and Sayers, R. R., *Pub. Health Rep.*, 1934, **49**: 80.

In an earlier study one of the authors came to the conclusion that the reaction of live animal tissue to the injection of foreign bodies is essentially the same in all parts of the body. In the case of dusts it is desirable to have a quick and simple method of determining irritant bodies and

the use of the peritoneum seems to supply this method. A number of suspensions of different dusts in physiological saline were injected in the peritoneal cavities of guinea pigs. The results achieved were quite striking. Calcite (calcium carbonate) produced nodules in the peritoneum after 30 days, but these nodules became progressively smaller until they were completely absorbed by the end of 90 days. Limestone (largely calcium carbonate with traces of magnesium, iron and silica) caused a very similar reaction. Gypsum (largely calcium sulphate) reacted similarly. Portland cement produced a more severe initial reaction, but the final outcome was practically the same. Quartz, chat and flint, all of which are high in silica produced nodules which progressively increased in size. The reaction essentially was one of proliferation, with the formation of fibroblasts which would lead ultimately in all probability to scar formation. Soapstone, carborundum (silicon carbide), jeweller's rouge (ferric oxide), anthracite coal and bituminous coal dusts were relatively inert.

FRANK G. PEDLEY

Some Cases of Carbon Tetrachloride Poisoning in Connection with Dry Shampooing and Dry Cleaning, with a Survey of the Use and Action of the Substance. Moller, K. O., *J. Ind. Hygiene,* 1933, **15**: 418.

Moller reports 6 cases of intoxication from carbon tetrachloride, used either as a hair shampoo or as a dry cleaning agent. Five of these cases were acute and of short duration; the sixth case did not recover completely for some months. Carbon tetrachloride is used as a solvent of fats, as a solvent and vulcanizer of rubber, as a fire extinguisher, and as an anthelmintic drug. In all these spheres it may cause poisoning.

Many years ago carbon tetrachloride was investigated as a possible anæsthetic, but was found to be too toxic. It does have an anæsthetic action, however, and many of the cases of acute intoxication are really cases of early anæsthesia. Like chloroform, to which it is closely akin chemically, carbon tetrachloride occasionally produces degenerative changes in the liver, and this action, together with a possible kidney action, is the most serious effect to be feared. Occasionally, in the use of carbon tetrachloride as a fire extinguisher, a certain amount of the substance, under conditions of heat and lack of oxygen, is converted into phosgene, which, it will be remembered, was one of the most effective war gases.

It is the opinion of the author that the use of carbon tetrachloride as a shampoo should be definitely prohibited, but that its use as a dry cleaner might be permitted under controlled conditions.

FRANK G. PEDLEY

The Longevity of our Neighbours in Canada. *Stat. Bull., Metropolitan Life Insurance Co.,* 1933, **14**: 1.

A life-table for Canada, covering the years 1929 to 1931, has been completed by the Statistical Bureau of the Metropolitan Life Insurance Company. Such tables illustrate certain interesting points which perhaps have not been appreciated before.

In the first place, the expectation of life of a baby at birth in Canada (if the Province of Quebec be omitted) is definitely greater than in the United States. The figure for males in Canada is 60.74 years as compared with 59.31 for white males in the United States. For females the figures are 63.23 and 62.83 respectively.

Secondly, if we include the Province of Quebec but eliminate the first year (when the mortality is particularly high in Quebec), the Canadian still has a better expectation.

A striking feature of the Quebec figures is the fact that males have a better expectation of life than females in the early ages (1 to 28 years). In the United States among white persons, male mortality is in excess of female mortality at every age of life. In Quebec, females have a higher mortality than males over a large part of life (ages 4 to 45). It is possible that excessive child-bearing may have some influence in creating this unusual situation.

FRANK G. PEDLEY

Pathology and Experimental Medicine

The Production of Experimental Plaut-Vincent's Angina in the Dog. Wallace, H., Wallace, E. W. and Robertson, O. H., *J. Clin. Invest.,* 1933, **12**: 909.

Wallace and his co-workers at the University of Chicago became interested in the problem of the production of Vincent's angina after they had observed its accidental occurrence in dogs which had received scillaren B, one of ten glucosides found in squills. In the series of experiments reported 11 dogs were employed, all of which contracted Vincent's angina. Scillaren B was administered to 10 dogs intravenously at daily intervals until about 55 per cent of the lethal dose had been given. The average period of survival after the injections had been started was about 14 days, when death occurred because of ventricular fibrillation. The dogs became definitely ill on the third day after the beginning of the injections. There was vomiting, and later malaise and depression. By the sixth day the gums showed gross evidence of inflammation, and numerous fusiform bacilli and spirochætes could be found about the gum margins of the teeth. During the second week of the disease, the gingivitis and the stomatitis proceeded to ulceration. As the experiment advanced, the

animals grew progressively more emaciated. Fever was not present during the course of the illness. Auriculo-ventricular dissociation was produced by scillaren later on in the disease. Smears taken directly from the gums of infected animals, and employed as a means of direct inoculation on dogs not receiving scillaren failed to produce the desired clinical picture. Autopsies were carried out on all the animals. These showed pathological changes only in the mouth. The ulcers in the mouth revealed the clear-cut margins, with the predominance of the fusiform bacilli in the superficial layers of the ulcer and spirochætes in the deeper portions. These findings were similar in all respects to those found in the human cases of the disease.

The bacteriological results were likewise similar to those observed in human beings suffering with the disease. In the early stages the fusiform bacilli were small and outnumbered the spirochætes. Later the bacilli assumed their large "adult" character and the spirochætes became more numerous. The authors were able to culture the fusiform bacilli, but failed to grow the spirochætes recovered from the lesions.

The authors cannot account in any way for the specific pathogenic effects of scillaren B in producing Vincent's angina. It is their belief, however, that the drug produces its results through the general depressant action upon the body rather than in any specific manner. They also suggest that an impurity in scillaren B, thus far unidentified, and not the drug itself, may be responsible for the changes observed here. The next steps in working out the etiology of the disease would appear to be firstly the production of the syndrome in anthropoid apes, and secondly the isolation of the impurity in the drug, if the former is responsible for the disease.

J. FEIGENBAUM

Precipitin Reactions in the Blood of Rheumatic Patients Following Acute Throat Infections. Schlesinger, B. and Signy, A. G., *Quart. J. of Med.*, 1933, **2**: 255.

In a previous research, the authors had noted a "silent period" of ten to twenty days which almost invariably intervened between a rheumatic relapse and the tonsillitis or pharyngitis which preceded it. While during this period the temperature is normal and the patient feels well, it was thought probable that reactions were taking place in the patient's defence mechanism which might be demonstrable in his serum. For this reason, the authors, concentrating on one reaction because of the simplicity of its demonstration, have searched for specific precipitins during the silent period following throat infections in rheumatic subjects. As a precipitinogen or antigen, two filtrates of ground-up streptococci, one from a *streptococcus hæmolyticus* and one from a *streptococcus viridans* strain, were used. Blood sedimentation rates were concurrently estimated by Dr. W. W. Payne (separate communication). It was found that the sedimentation rate was raised during the acute throat infection, but returned to normal unless there was a reactivation of the rheumatism; this reaction is of course quite non-specific. Twenty-one cases in all were investigated. Eight showed no evidence of rheumatic relapse following the acute throat infection, and of these, only one developed any precipitin. Four cases, controls, had never had rheumatic infection; one only showed a faint precipitin reaction following the throat infection. Nine cases showed, some weeks after the throat infection, a tendency to relapse (brief pyrexia, one or two weeks' tachycardia, a drop in the previously increasing rate and a fresh rise in sedimentation rate) or, in three cases, actually developed severe relapses, with fulminating fatal pericarditis in two. Only in this group did the precipitin reactions appear with any degree of regularity, being definite in 7 out of 9 cases, and especially marked in the 3 severe ones. The precipitin in each case corresponded to the type of streptococcus responsible for the throat infection, but a certain amount of cross-precipitation was noted.

The demonstration of streptococcal precipitins following such mild and fleeting throat infections, principally in association with acute rheumatic relapses, appears to the authors to be of major importance. It is strong evidence in favour of Poynton and Payne's original theory of the bacteriology of rheumatism. Since precipitins to the streptococcus hæmolyticus were not found exclusively, the authors feels that eventually a common streptococcal nucleoprotein, or some other integral part of the organism, may prove to be the essential cause of the disease.

W. FORD CONNELL

The Evidence for a Cerebral Vascular Mechanism in Epilepsy. Penfield, W., *Ann. Int. Med.*, 1933, **7**: 303.

The author reports his observations on 43 cases of focal epilepsy in which osteoplastic bone flaps were raised and the brain stimulated by galvanic and faradic currents. The patients were conscious. In 30 cases, aura, local attack, or generalized attacks were produced. In these, vascular changes were recorded. In the cases in which no response to stimulation was elicited, no vascular changes were noted.

During the attacks, the principal feature noted was a cessation of arterial pulsation, the arteries being viewed through a magnifying glass. After an attack, the most frequent sequel noted was focal anæmia, usually in the neighbourhood of the area stimulated. In other cases, increased blood flow associated with an increased pulsation of the arteries was

the feature. Six cases showed constriction of one or more pial arteries.

The author believes that the vasomotor changes are due to vasomotor reflexes subserved by nerve cells upon the blood vessels of the brain, and by a local nerve plexus which in some cases is significantly increased.

E. S. BIRD

Obituaries

Dr. William Gardiner Anglin, of Kingston, Ont., for several years physician to Kingston Penitentiary, died on February 4, 1934. He had retired from the penitentiary position about five years ago and had been in ill health for the last two years. Dr. Anglin, for a number of years, was on the staff of the Medical Faculty at Queen's University, and in 1915 went overseas with the Queen's Hospital members, being stationed at Cairo, Egypt. He was invalided home and was appointed physician of the penitentiary. He was born in 1856 and a graduate of Queen's University (1883).

Dr. Kelso C. Cairns, of Swift Current, Sask., died recently from a heart attack at his home after two days' illness. Dr. Cairns was 51 years of age, and was born at King, Ont., 25 miles north of Toronto. He attended Toronto University, where he was a noted lacrosse player. He took up practice at Lumsden, Sask., in 1906 and in 1912 moved to Swift Current. In 1916 he went overseas as medical officer for the 209th battalion. He was transferred to the medical transport services and served there until the end of 1918, when he came back to Swift Current to take up his practice.

Dr. Cairns is survived by his widow; one daughter, Jean; his mother; two brothers, Dr. L. I. Cairns, of Calgary, and Dr. J. Cairns, of Vancouver; and one sister, Mrs. Morris, of Hamilton, Ont., who is practising law.

Dr. A. B. Chandler, of Montreal, died with startling suddenness on February 13, 1934, while attending the annual meeting of the Child Welfare Association. He had not been in good health for about two years, having suffered from several heart attacks, and had been obliged to give up most of his professional activities.

Dr. Chandler was born in Montreal just over half a century ago, the son of the late Professor G. H. Chandler, of McGill University, and Mrs. Chandler, formerly Miss Butler, of Brome. He was educated at the Montreal High School and graduated from McGill University with his B.A. and M.D. degrees, in 1906. For some years he practised medicine at Rossland, B.C., but on the outbreak of war came east and served overseas for four years with the Canadian Army Medical Corps. On his return to Montreal he was appointed pædiatrician to the Montreal General Hospital and was in charge of the children's department of that institution at the time of his death. He was attached to the staff of the faculty of medicine at McGill University as Lecturer in Pædiatrics and founded the McGill Nursery School in conjunction with a number of citizens interested in promoting the welfare of children. This school did invaluable work for a number of years but was recently closed on account of lack of funds.

Dr. Chandler was acting physician to the Day Nursery and a director of the Mental Hygiene Institute and was associated with practically every movement that had anything to do with children.

It was his association with the Child Welfare Association of Montreal that brought him into contact with most of his young patients, for he had been with it as medical director ever since its foundation, some 14 years ago. He was always at its service, not only visiting the health clinics established all over the city, giving advice to mothers and attending to the ailments of the children, but answering calls from any of the visitors of the Association who came across a case that needed medical attention. To say that 10,000 children attached to these health centres had benefited from his kindly ministrations would be to greatly underestimate the number who owe much to his skill. His cheery sympathetic manner quickly won the friendship of the little ones. He not only gained the confidence of the children but among his colleagues in the medical profession he was held in the highest esteem.

Since his return from the war Dr. Chandler maintained his interest in and connection with military affairs, and recently had been gazetted as Lieutenant-Colonel in charge of No. 4 Casualty Clearing Station C.A.M.C. He was a member of the University Club and of the University Lodge, A.F. & A.M. He is survived by his widow, formerly Miss Helen Taylor, of Perth, Ont., and one daughter, Miss Joan Chandler.

Dr. William Crawford, of Hamilton, Ont., died on February 2, 1934, aged 66 years. He was a graduate of the University of Toronto (1892). He is survived by his widow, Mary Scott, and a son, A. Scott Crawford.

Dr. Carlton Yates Ford, for the last few years connected with the Union Metal Products Company of Canada, died on February 20, 1934, at the age of fifty-five.

Dr. Ford was born in Kingston, Ont., in 1879 and graduated from Queen's University and the Harvard Medical School. He was associated with the Dansville Sanatorium and the Neurological Institute of New York after his graduation.

While on a trip to England in 1914 the Great War broke out and he enlisted with the Coldstream Guards. He went to France with the first British contingent and was mentioned several times in despatches, winning the Military Cross. In 1916 he was severely shell-shocked and on his return to Canada was forced to abandon his medical career.

Dr. William Hall, of Fort Qu'Appelle, Sask., aged 77, one of the oldest graduates of Queen's University, and the physician who had practised the greatest number of years in Saskatchewan, died about January 2, 1934.

Dr. George Vernon Harcourt, M.P.P., of Powassan, Ont., died on February 1, 1934, in Toronto, less than three hours after he had left his seat in the Toronto Legislature. He was Member for Parry Sound. The cause of death was coronary thrombosis.

Dr. Harcourt was born at Port Hope in 1874, the son of George Harcourt and Frances Morton Harcourt. He was educated at Trinity College School, Port Hope, and at the University of Trinity College, Toronto, graduating in Medicine in 1896.

Dr. Harcourt was one of the best known physicians in the north country, having a wide practice throughout Parry Sound and the surrounding district, for nearly 40 years. He practised for several years at Elk Lake and then settled at Powassan. One of his interests was the development of the mining industry.

He was first elected to the Legislature in the general election of 1923, being re-elected in 1925 and 1929. He was a bachelor and is survived by a sister, Mrs. Sarah Storey, of Port Hope, and a nephew, Dr. E. H. Storey, of Bowmanville. He was of Irish stock, his grandparents coming to Canada from Ireland in the early days of Durham County.

Dr. William John Hendry, son of Dr. W. B. Hendry, Professor of Obstetrics and Gynæcology at the University of Toronto, and an honour graduate in medicine of the University of Toronto, died in Baltimore on February 17, 1934, from infantile paralysis. He was 23 years of age.

He was engaged in research work in the medical school at the Johns Hopkins Hospital, going there last September. Dr. Hendry graduated from the University of Toronto last year, and was awarded the Ellen Mickle Fellowship, which entitled him to a year's research work. He won the highest honours in his graduating year and was awarded the gold medal at the medical school.

Surviving are his parents and a brother, George, now engaged in medical studies at the University of Toronto.

Dr. Thomas James Jamieson, of Ottawa, died on February 6, 1934, in his 73rd year. He was born at North Gower, and was a graduate of Trinity University (1888).

Dr. Ernest Charles Daniel MacCallum, of Kingston, Ont., died on February 6, 1934, in his 61st year.

Dr. MacCallum was a member of the faculty and the senate of Queen's University. Born in Maxville, Ont., in 1872, he graduated with honours from McGill in 1897. He took a post-graduate course at Royal Victoria Hospital, Montreal, and subsequently established a general practice in Western Ontario. In 1910 he married Miss Jessie Wiseman, of Clinton, and after a year in London and Glasgow hospitals, settled in Kingston. From 1911 until his death he was lecturer and associate professor of medicine at Queen's University. He took keen interest in public affairs.

For some years he acted on the examining boards of the Dominion and Ontario Councils of Physicians and Surgeons, and as physician to the Orphans' Home, and from 1922 to 1929 was president of the Children's Aid Society.

He is survived by his widow in Kingston; two brothers, Dr. F. W. MacCallum, of Istanbul, Turkey, and Arthur MacCallum, of Trail, B.C.; and four sisters, Miss Emily MacCallum, of Athens, Greece; Mrs. Harriett MacDermid, of Martintown, Ont.; Mrs. T. B. Scott, of Auburndale, Mass., and Miss Edith MacCallum, of Greeneville, Tennessee.

Dr. Daniel Murray, of Campbellton, N.B., died there early in December, 1933. He was seventy-six years old. Dr. Murray was born at Plainfield and after teaching a number of terms in the vicinity of Scotsburn he entered Pictou Academy. From there he went to study at Dalhousie University and later graduated from McGill (M.D., C.M., 1886). Shortly after graduation he located in Campbellton, where he practised for forty-six years.

Dr. Edward William Nolan, of Toronto, died on February 25, 1934, at his residence, in his 43rd year. He was born in Toronto, educated at De la Salle Institute, St. Michael's College, University of Toronto, and at Queen's University, graduating in medicine in 1916. He volunteered for active service in the Great War, joined the C.A.M.C., going overseas with that unit. On returning to Canada he commenced practice in Toronto.

Dr. Samuel Petersky, of Vancouver, died suddenly on February 16, 1934, while addressing a gathering. The late Dr. Petersky, who was fifty at the time of his death, was a native of Winnipeg. He graduated from McGill in 1906, practised in various interior towns, and for some years in Vancouver. He was prominent in Jewish affairs, and in politics, an active Liberal. He is survived by his wife.

Dr. William Norrie Robertson, of Toronto, died on February 19, 1934, at St. Michael's Hospital, Toronto, in his 80th year.

Born near Stratford in 1855, he was educated at Pickering College and Victoria University, from which he graduated in 1884, taking a post-graduate course at Edinburgh, Scotland. After leaving Scotland he became a ship's surgeon on a line plying between Liverpool and Bombay. He commenced practice in Stratford in the late '80's, continuing until a few years before the Great War, when he came to Toronto.

A great exponent of outdoor life, he hiked to the Yukon in the '90's to participate in the gold rush. It was as a cyclist that he achieved note. He held the 100-mile road record, having covered the distance in 5 hours and 50 minutes; and the 24-hour record of 255½ on the road, and the Toronto-Sarnia record of 209 miles in 18 hours and 20 minutes. These records were made on the old high wheel type of bicycle, and in recognition of them he was elected a life-member of the Canadian Wheelsmen's Association.

At one time Dr. Robertson was medical officer on the northern section of the Canadian Northern Railway. In the Great War he volunteered and was accepted on the home medical staff.

He was an author of considerable distinction, "Yukon Memories" being one of his best known works. He married in 1892 Jane Annie Monteith, of Perth County. His widow and a son, W. N. Robertson, barrister, of Toronto, survive.

Dr. William Logan Silcox, Hamilton, Ont., died at his late residence on February 27, 1934, aged 62. He was a graduate of the University of Toronto (1896). He is survived by his widow, Jennie Heath Silcox.

Dr. Alphonse Thibault, of Danville, Que., died on February 23, 1934, at his residence, in his 77th year, after a lengthy illness. He was born in St. Benoit, Que., in 1857, finished his classical studies at Montreal College, and studied medicine at the School of Medicine and Surgery (Victoria) of Montreal in 1885, afterwards taking a post-graduate course in Syracuse University. In 1887 he married Cordélie, daughter of Mr. and Mrs. Zoel Cyr-Miquelon of St. Camille. In 1904 he was elected governor of the College of Physicians and Surgeons of the Province of Quebec, and held office as such until 1930.

Dr. Benjamin Edward Thompson, of Stony Creek, Ont., died on January 8, 1934. He was a graduate of the University of Toronto in 1891. He is survived by a son, Dr. Clarence E. Thompson and a brother, Dr. Alfred A. Thompson.

Dr. Seymour Traynor passed away at his home in Vancouver, on March 2, 1934. A graduate of Toronto (1905), Dr. Traynor had practised in British Columbia since 1906. He served with the C.A.M.C. overseas, and had been in poor health for some time.

Dr. Archibald Wilson, of Toronto, died on February 7, 1934, in his eighty-second year.

Born in Manvers Township, Durham County, he was educated in the local public schools and at the old Trinity University Medical School, graduating in 1878. For more than three decades he practised in Fenelon Falls.

Early in the present century he came to Toronto and was on the staff of the Western Hospital for many years, also medical director for Dr. Barnardo's Home for 22 years.

Dr. Wilson married twice and is survived by his widow, Naomi Holford Wilson; three daughters, Mrs. F. C. Hare, Elmira, N.Y., Miss Lillian Wilson, Los Angeles, and Mrs. A. E. Hollings, Toronto; two sons, A. E. Wilson, Calgary, Alberta, and G. B. Wilson, Cincinnati; five grandchildren and a brother, Richard Wilson, Lifford, Ont.

News Items

Great Britain

Princess Elizabeth of York Children's Hospital, London.—A lecture of exceptional interest was given at the monthly meeting of this hospital on January 26th by Mrs. Lillian Lindsay, L.D.S., Hon. Librarian of the British Dental Association, who took as her subject "The influence of the sun upon the teeth — ancient and modern". Primitive man, the lecturer explained, was struck by the indestructibility of the teeth after the decay of such vital organs as the heart, the brain, and the liver. By an association of ideas, the teeth were linked with the sun, the symbol of immortality. They came to be looked upon as the most vital parts of man, and the earliest codes of laws contain severe penalties for people who, by accident or design, deprived their neighbours of their teeth. At the initiation into manhood and womanhood in different primitive tribes the front teeth are knocked out, and in the Fiji Islands at the coronation ceremony strings of whales' teeth, four or five hundred, are hung round the king's arm. All the early toothache remedies are connected with sun-worship. In the Babylonian legends, Tiamât the Worm is the enemy of the Sun-God. Anything that caused decay and loss of the teeth, and hence weakness and approaching age, was looked upon as an arch-enemy. The enemy of the sun was the darkness, personified by the serpent or the worm. The Arabs are accustomed to throw shed teeth towards the sun, and Mrs. Lindsay reminded her listeners of the still customary superstition to drop the shed teeth of children into the fire, a relic of sun worship. With the eloquent help of interesting slides and of learned and amusing allusions to folklore, literature, and ancient materia medica, the lecturer in the space of an hour covered a bewilderingly extensive field of facts and superstitions. The last slide shown was one of the actino-therapy department at the Royal Dental Hospital, London.

W. R. BETT

Lord Mayor Treloar Cripples' Hospital, Alton.—On January 29th Sir Henry Gauvain, the Medical Superintendent, took the Chair at this Hospital for a lantern-lecture on "The language and stature of Dürer" by Mr. W. R. Bett, M.R.C.S., Anæsthetist to the Shadwell Children's Hospital. The lecturer contented himself with giving only a few biographical details and dates lest the voice of boredom be heard in the land. Dürer's must have been an attractive and fascinating personality. The most illustrious of his contemporaries he numbered among his friends, and himself enjoyed the personal friendship of that baffling monarch, the Emperor Maximilian. He was one of the most industrious and many-sided artists the world has ever seen, though he limited the mission of painting to two objects: in the service of the Church, to depicting the sufferings of Christ; and to preserving the features of men after their death. Among the lantern-slides shown were some of Dürer's most famous works: Christ on the Cross; Hans Imhoff, Dürer's banker, the crown of his portraits; the Adoration of the Magi ("so gloriously beautiful that one could stand before it for hours, drinking in its delights"); The Four Horsemen of the Apocalypse; The Four Apostles; The Hare; Dürer's Self-Portraits; and many others. At the conclusion of his lecture which was illustrated by apt quotations from Rupert Brooke, John Masefield, Walter Pater, Laurence Binyon, and the Bible, Mr. Bett emphasized the suggestion of unachieved desire and a certain over-elaboration from which few of Dürer's works are entirely free.

W. R. BETT

The London School of Hygiene and Tropical Medicine.—His Royal Highness the Prince of Wales has graciously consented to become Patron of the London School of Hygiene and Tropical Medicine, with which is incorporated the Ross Institute. This gratifying announcement was made at the Staff and Students' Dinner by Sir Austen Chamberlain, the Chairman of the Court of Governors.

Alberta

The Workmen's Compensation Board of the Province of Alberta is reported to be planning a new schedule of fees for medical services, to be submitted to the profession for their consideration in a short time. We are advised that the idea of a new schedule is for a more equitable adjustment of fees, so that the attentions to injured workmen for the more difficult cases will be more highly remunerated, while the lesser attentions may carry reduced fees. The question is to be referred to the Council of the College of Physicians and Surgeons, which in turn will take time to consider it and consult the profession generally before any change is made in the present schedule. As the Medical Aid Fund showed a deficit for the years 1931-2, the profession accepted a discount off all accounts over $5.00 for 1933. An increased assessment was placed on the workmen in the more hazardous occupations; thus by these means there was no deficit in the Medical Aid Fund for 1933, but a surplus of $24,000.00 was shown. Therefore, pending the adoption of a new schedule of fees, the discount on the doctors' accounts will be cut in two, commencing March 1st.

There has been considerable difficulty in financing hospitals during the depression period. Some municipal councils are unable to collect their hospital taxes, while others, having funds in hand, are able to pay them in advance, so an amendment to the Hospitals Act is being passed whereby a hospital may allow 7 per cent discount on all pre-payments and charge 7 per cent interest on all overdue accounts from municipalities.

An amendment is made in the Act whereby a degree of B.Sc. in nursing from a recognized university is made a qualification which may be accepted for registration; and further, the standard of education required of a person entering upon a course of hospital training, leading to registration, is raised from grade 8 to grade 11.

There has been some agitation to have an Act passed making it compulsory for people contemplating matrimony to present to the issuer of marriage licenses a certificate that the applicant is not suffering from any communicable disease. To be effective, it will be necessary for marriages to be delayed until a complete and thorough examination, which will consume a lot of time and be expensive, is made. The profession will be well advised to give no certificate unless ample time is given for a proper examination, and there is some protective clause in the proposed Act making it impossible for any damage action to be taken against the profession in connection with the issuance of the certificate.

With the increase in the number of motor cars there is an ever-increasing number of motor accidents, and in many cases transients, people without means or uninsured have nothing to pay for medical attention and hospitalization. An unreasonable and unnecessary burden is thus being placed on the hospitals and on the profession. The Government has been asked again this year to create a fund, either by a small annual license fee to be paid by all car drivers, whether resident or transient, or in some other way more satisfactory to the Government.

G. E. LEARMONTH

British Columbia

The Vancouver Medical Association has announced its program for the Summer School, which will be held from June 26th to 29th, inclusive. Dr. C. E. Dolman, of Toronto, will speak on recent work on staphylococci; Dr. F. W. Lynch and Dr. Naffziger, of California, Dr. W. C. Alvarez, of Rochester, Dr. Max Cutler, of Chicago, and Dr. C. A. Aldrich, of Winnetka, Ill., complete the list.

The Provincial Board of Health is considering reducing the period of quarantine in scarlet fever, to conform with the practice in eastern communities, and has invited expressions of opinion from medical officers of health throughout the province.

It is announced that the recently elected Provincial Government is definitely committed to giving the chiropractors legal recognition. When the legislation will be introduced is not known, but it is understood that they will be given their own examining and governing powers.

Progress in organizing a definite campaign against tuberculosis in and around Vancouver is proceeding rapidly. A committee of representative citizens has been elected, and a survey of activities to be undertaken is being made. C. H. BASTIN

New Brunswick

Dr. Charles W. McMillan, District Medical Health Officer, reporting on vital statistics for the city of Saint John, stated on January 25th that there had been an increase in the death rate from tuberculosis in the city for the year 1933. The rate for 1933 was 109.3, as compared with 75.7 in 1932, for 100,000 population. There had also been an increase in the infant mortality rate for the City of Saint John, the infant death rate for 1933 being 93 per 1,000 live births as compared with 73 in 1932. Dr. McMillan stated that these two death rates had been exceptionally low in 1932 in all portions of Canada and this sudden increase may be considered as compensatory.

A long felt need has been realized by the opening of a local hospital in Minto. The hospital is situated in a remodeled building which provides accommodation for 20 beds. X-ray apparatus and operating equipment have been purchased and the establishment of this hospital will provide more satisfactory arrangements for treatment of the many industrial accidents which occur in this busy section of the province. The medical staff comprises Drs. H. M. Gardiner and D. W. Buchanan, of Minto, and Drs. H. B. Haye and H. E. Baird, of Chipman.

At the January meeting of the Commissioners of the Saint John Tuberculosis Hospital it was stated that the institution had cared for 479 patients in 1933, which is a new high record, indicating the increasing usefulness of this institution. The hosptal had practically a capacity population throughout the year.

At the annual meeting of the governing board of the Moncton City Hospital, Dr. A. R. Landry was named as a member of the Consulting Staff. Dr. R. G. Girvan was appointed anæsthetist, succeeding the late Dr. L. H. Price.

To provide hospitalization for the unemployed who are engaged on the Federal Relief Project in Sunbury County, N.B., a hospital was opened in the former Orthopædic Hospital of the D.S.C.R. group of buildings in Fredericton, under the command of Major A. A. James, R.C.A.M.C., of Halifax.

In the report of the Chief Medical Officer of New Brunswick to the Minister of Health, Dr. Wm. Warwick stated that, although the birth rate for New Brunswick for 1932 showed a decline of three per thousand of population, the rate for the province was the second highest in the Dominion. The percentage of illegitimate births was 3.4. The decline in the marriage rate, which has been in progress for the past few years, was again in evidence. The rate dropped from 6.2 for 1931 to 5.8 for 1932. The death rate for the year was 11 per 1,000, the lowest ever recorded.

Hon. Dr. H. I. Taylor, Minister of Health and Labour in the New Brunswick Government, reported to the legislature that there were substantial decreases both in the number of cases and the deaths resulting from notifiable diseases during 1932. In this same year the tuberculosis death rate for New Brunswick reached a new low level, namely, 79 per 100,000.

Dr. J. V. Anglin, Superintendent of the Provincial Hospital for the Insane, reports that the average number of patients resident in the hospital during 1933 was 880, the largest number since the institution was established. Of the 186 who entered the hospital during the twelve months, 138 were first admissions.

It has been officially announced that a large, modernly equipped hospital will be built in Edmundston in the near future. The hospital will be directed by the nursing sisters known as Les Religieuses Hospitalières de Saint-Joseph, who have been for many years in charge of the Hôtel-Dieu Hospital at Saint Basil, a few miles from Edmundston.

In the report of the Workmen's Compensation Board of New Brunswick, tabled in the legislature, it is shown that the total expenses incurred by the Board were $359,593.66, the lowest figures since 1918. Of this amount, medical aid accounted for $82,513.89.

The present winter has supplied several tales of difficulty and adventure in the lives of rural medical services in this province. Another such was added late in February when a patient working in the neighbourhood of Saint Martin's was seriously injured in a dynamite explosion. Dr. L. L. Kilpatrick laboured for four hours to cover the ten miles before the injured man was reached. The doctor's own experience indicated that ordinary methods of transportation would be futile in attempting to take this patient to Saint John. Consequently a tractor belonging to the Lumber Company was attached to a sleigh, and under this form of motive power the injured man was dragged over almost impossible roads to a point near Saint John where they were met by ambulance. The victim of the accident, in spite of the difficulties presented, is enjoying a satisfactory convalescence.

It is very much regretted that Dr. D. P. Mahoney, of Saint John, has again been confined to his home by illness.

Dr. Fred. C. Jennings, Saint John, has returned from a trip to Great Britain on the *S.S. Letitia*, replacing the regular ship surgeon who was confined to hospital in Saint John.

Dr. Geo. Irvine, until recently of the intern staff of the Saint John General Hospital, has begun practice at Plaster Rock, N.B.

Following his appointment as full time employee of the School Inspection Service of the Province of New Brunswick, Dr. H. B. Bustin resigned his position as one of the senior physicians on the staff of the Saint John General Hospital. Dr. W. O. McDonald has been appointed to fill this vacancy.

At the annual meeting of the Saint John Health Centre Association, Dr. Wm. F. Roberts was elected President, and Dr. H. A. Farris, second Vice-President.

A. STANLEY KIRKLAND

Nova Scotia

The Nova Scotia Society for Mental Hygiene held its 25th Annual Meeting in Halifax recently, under the presidency of Dr. S. H. Prince. The meetings were largely attended, and great interest was shown in the subjects treated. The chief speaker was Dr. C. M. Hinks, of New York, Head of the National Committee for Mental Hygiene for the United States. Dr. Hinks stressed the need of adequate facilities in treating mental cases by modern methods. Dr. F. R. Davis, Minister of Health for the Province, spoke on the subject "Mental hygiene—a public responsibility." Dr. G. J. Trueman, President of the New Brunswick Council of Mental Hygiene, gave an address on feeble-mindedness in relation to heredity. Other speakers included Archbishop Worrell and members of the legal and medical professions. Dr. Murphy outlined the history of the efforts made on behalf of the mentally ill in this Province.

Dr. Donald A. Forsyth, who graduated from Dalhousie University in 1931, has returned to Dartmouth, where he is setting up in practice. After graduation he spent two years as house-surgeon at the Hillcrest Hospital in Pittsfield, Mass. Dr. Forsyth served overseas in the 8th Canadian Siege Battery.

Dr. Hugh N. MacDonald, veteran practitioner of Whycocomagh, paid a visit to Halifax on the occasion of the "Queen's Alumni Luncheon" in honour of Principal Fyfe of Queen's University. He retired from practice last year at the age of 77, and is still enjoying very good health. He was the first Nova Scotian to study medicine at Queen's University. While an undergraduate he received the appointment of gymnasium instructor of the University—at that time a really onerous task. During his early years he was prominently associated with athletic affairs in Canada.

N. B. DREYER

Ontario

The Leeds and Grenville Medical Society met at the Brockville General Hospital on February 12th. Dr. J. W. S. McCullough, of Toronto, spoke on the promotion of the campaign of general education in order that earlier diagnosis of cancer may be obtained.

The Lincoln Medical Association met at the St. Catharines General Hospital on February 15th. Dr. W. P. Warner, of Toronto, addressed the Society on "Bronchitis, bronchiectasis and bronchial asthma." At this meeting, there was a discussion of the question of combined fee and compulsory membership in the Ontario Medical Association and the College of Physicians and Surgeons of Ontario.

The Essex County Medical Association met in Windsor on February 14th, when Dr. Geo. Crile, of Cleveland, spoke on the subject of the physiology and surgery of the adrenal gland and its sympathetic nerve and its control.

A group of physicians in London, Ontario, has organized a Noon-Day Study Club, with Dr. C. Sanborn, Honorary President, and Dr. J. F. G. Colling, of Lambeth, President. It is proposed to have luncheon meetings every Wednesday noon when a paper will be presented, followed by discussion. The Club is to be open to physicians in Western Ontario.

In an address at the Civic Luncheon which marked the Centenary of Toronto's incorporation as a city, the Honourable Dr. H. A. Bruce, Lieutenant-Governor of Ontario, asked that the Civic Fathers pay attention to the slum districts and appoint a commission to study means whereby model dwellings may be provided to replace many undesirable ones in the crowded districts.

The Honourable Dr. J. M. Robb, Minister of Health for Ontario, in his report for 1933, points out that, whereas in 1292 there were 3,757 deaths in the Province from organic heart disease, in 1932 there were 6,679, an increase in the ten years of 78 per cent. The maternity death rate shows no improvement from the previous years, but the infant death rate of 51 per 1,000 living births shows a marked reduction. This is 10.8 per cent less than the 1932 figures and 33.9 per cent below the 1923 rate. The total deaths from diphtheria in 1923 were 316; last year 56. Typhoid fever deaths have fallen in the ten years from 238 to 44.

The Bills submitted to the Ontario Legislature giving extension of powers to drugless practitioners have been withdrawn.

An active movement is on foot to finance an additional 100 beds for the Essex County Sanatorium.

The Ontario Association of Rural Municipalities passed a resolution asking the Ontario Government to levy a 5 per cent hospital tax on all meals costing over fifty cents sold in hotels, restaurants, clubs and dining cars.

The Department of Public Welfare of the City of Toronto has announced that the cost to the city of indigent hospital patients during 1933 was $1,355,168.74.

The personnel of the supervising committee for the Ontario Institute of Radiotherapy in Toronto was recently announced by the Honourable Dr. J. M. Robb, Minister of Health. It is George A. Morrow, Frank P. Wood and Mark H. Irish, representing the General Hospital; Rev. Canon H. J. Cody and T. A. Russell, from the University of Toronto; and H. H. Williams, J. S. McLean and Thos. E. McDonnell, representing the Ontario Government.

The Ontario Medical Association has recently organized a committee known as the Study Committee on Medical Services in Ontario, under the Chairmanship of Dr. W. S. Caldwell, of Toronto. This committee met for the first time on March 2nd and several very interesting papers were presented dealing with the provision of adequate medical services to the indigent and near-indigent. A complete report will be made to the annual meeting in May.

In the program of Saturday evening lectures, given in Convocation Hall, University of Toronto, under the auspices of the Royal Canadian Institute, Dr. J. H. Elliott, Professor of the History of Medicine, lectured, on February 24th, on the subject "The surgeons of York and the part they played." This was a pre-centenary celebration lecture dealing with the physicians and surgeons, both military and civilian, who played a prominent part in the Town of York before it was incorporated, in 1884, into the City of Toronto.

J. H. ELLIOTT

Saskatchewan

At the monthly meeting of the Regina Grey Nuns' hospital staff Dr. J. B. Trudelle presented a case of cardiac asthma.

Dr. Urban Gareau discussed a case of osteomyelitis of the hip in a child. The lesion was in the great

trochanter. Operation was not done, on advice of Dr. Beattie Martin. Later the heel was infected; a sequestrum was removed from it; a culture gave *S. aureus*. A series of x-ray plates showed the breaking down of the bone and, finally, healing. The child was given 100 drops of viosterol daily and was in the hospital two months.

A medical clinic was held at the Regina General Hospital. Dr. H. C. George gave a clinic on heart block; Drs. J. C. Black and O. E. Rothwell presented two cases of disseminated sclerosis, and Dr. E. K. Sauer presented a case of pulmonary embolism following a normal confinement. The symptoms were rapid pulse, pain, subnormal temperature, and the appearance of shock. The patient recovered. There was no sign of infarct of the lung and no rusty sputum. During the discussion Dr. H. M. Stephens said that during his thirty years of practice he had seen three cases of embolism following normal confinement; all were rapidly fatal.

LILLIAN A. CHASE

United States

The Mallory Institute of Pathology.—The formal opening and dedication of the Mallory Institute of Pathology was held in Boston City Hospital on December 13, 1933. Dr. Timothy Leary, medical examiner of Suffolk County, South, traced the development of the pathological laboratory from the early days, when all work was done in a small room connected with the boiler-house up to that date. The Mayor, James M. Curley, reviewed Doctor Mallory's various activities and accomplishments during his more than forty years' connection with the hospital. Doctor Mallory then expressed his appreciation of the honour conferred upon him in naming the building.

Dr. James Angus Doull, head of the department of hygiene and public health of the school of medicine, Western Reserve University, has just returned from the Philippine Islands, where he was engaged for five months in making an epidemiological study for the Leonard Wood Memorial Foundation for the Eradication of Leprosy.

Doctor Doull made his headquarters on the island of Cebu, which is the focal point for study of leprosy in the Philippines and about four hundred miles south of Manila. The project on which he spent most of his time was a census of the social and economic conditions and a physical examination of the more than six thousand inhabitants of the municipality of Cordova, on the coral Island of Mactan, a few miles from Cebu.

Doctor Doull found the Islanders remarkably co-operative. There was no hint of compulsion in his invitation to them to be examined. He found the incidence rate of leprosy about 16.5 per 1,000 population of Mactan.

Doctor Doull, it may be recalled, is a Nova Scotian, and a graduate in medicine of Dalhousie University, Halifax.

The American Medical Association.—We are asked to announce that all members in good standing in the Canadian Medical Association are always very welcome at the annual meetings of the American Medical Association, and those who find it convenient to attend the Cleveland meeting will be welcomed upon presentation of their Canadian Medical Association membership receipts.

General

First International Congress for Endocrinology at Marienbad, 24th to 26th May, 1934.—The Medical Society of Marienbad, the well known Spa, proposes to arrange an International Congress for Endocrinology, in view of the increasing importance of this branch of science. The chairman of the congress is Prof. Julius Bauer (Vienna); honorary members of the council are Geh. Rath. Prof. E. Abderhalden (Halle) and Prof. Wagner-Jauregg (Vienna).

This, the First, International Congress for Endocrinology will take place from May 24th to May 26th, 1934. Papers and reports will be read by E. Abderhalden (Halle), L. Asher (Bern), J. Charvat (Prague), B. Zondek (Stockholm), H. Eppinger (Vienna), W. Falta (Vienna), C. Foa (Milano), E. Gamper (Prague), A. Giuric (Prague), K. Hynek (Prague), F. Kisch (Vienna-Marienbad), E. Laqueur (Amsterdam), E. Leriche (Lyons), E. Nobel (Vienna), W. Nonnenbruch (Prague), J. Pelnar (Prague), N. Pende (Geneve), J. Snapper (Amsterdam), W. H. Veil (Jena).

All information concerning matters of science may be obtained from Prof. Julius Bauer, Wien IX., Mariannengasse 15; administrative and technical information from the Balneological Institute of Marienbad. Apply for this congress to the Balneological Institute, Marienbad. A limited number of rooms are available cost-free, when booked in time; otherwise, lodgings may be had at reduced prices. Cost of participation 50 Kc = 6 Sh = 6 RH = 10 Austrian schillings.

An International Reunion for Instruction in Reparative, Plastic and Æsthetic Surgery has been organized by Professor Burian, of Praha (Prague), and Doctor Claoué, of Paris, under the auspices of the Czech Faculty of Medicine of Prague and the French Scientific and Medical Alliance. The meetings will be held from Monday, May 14th to Saturday, May 26th, 1934, in both Paris and Prague. An interesting program has been arranged. The object of the reunion is to bring together young medical men of all nationalities who wish to instruct themselves in the specialty of reparative, plastic and æsthetic surgery. In Paris the afternoons will be kept free, so that opportunity may be given to visit various hospitals and private clinics where operations will be arranged by the Secretariat. The fee will be 300 francs.

For all information apply to the Secretariat of the Reunion, care of Doctor Claoué, 39, Rue Scheffer, Paris.

The International Union Against Tuberculosis.—The Ninth Conference of the International Union Against Tuberculosis (Secretary-General, Prof. Léon Bernard) will meet in Warsaw on September 4th, 5th and 6th, 1934, under the high patronage of H.E. the President of the Republic of Poland and under the chairmanship of Prof. Piezrrzynski, President-elect of the International Union. The discussion will be limited to three main subjects: Biological subject: "Biological variations of the tubercle virus", opening report by Prof. Karwacki (Poland); Clinical subject: "Tuberculosis of the bones and joints: treatment medical and surgical", opening report by Prof. Putti (Italy); Social subject: "The use and organization of tuberculosis dispensaries", opening report by Prof. Léon Bernard (France). Ten speakers, selected in advance from a list presented by the 43 countries belonging to the Union, have been designated to open the discussion on each of the questions on the agenda.

The Organization Committee of the Conference has prepared a very attractive program of receptions and excursions; the latter will enable members of the Congress to visit the chief anti-tuberculosis institutions as well as the most picturesque scenery in various parts of Poland.

Members of the International Union are invited to take part in the Conference free of any contribution fee. They may forward their application either through the medium of their Government or their National Association against tuberculosis, or directly to the Organizing Committee in Warsaw, to the following address: Organizing Committee of the IXth Conference of the International Union against Tuberculosis, Chocimska Street 24, Warsaw, Poland.

Persons who are not members of the Union and who wish to take part as "Members of the Conference" must forward their application, together with a contribution fee of 50 zlotys, exclusively through the medium of Canadian Tuberculosis Association, Plaza Building 304, Ottawa.

Reductions on hotel prices and railway fares will be granted to Members of the Congress.

Book Reviews

Treatment of the Commoner Diseases Met With by the General Practitioner. Lewellys F. Barker, M.D., Professor Emeritus of Medicine, Johns Hopkins University. 319 pages. Price $3.50. J. B. Lippincott Co., Philadelphia, London and Montreal, 1934.

For forty years a stream of books and medical articles has flowed from Dr. Barker's pen. This latest contribution deals with therapeutics and is just one more example of the author's delightful style, in an age when good English seems to be disappearing in medical literature. From his vast experience he has gathered what he considers essential in the treatment of common afflictions, and one has the feeling that every remedy he advises has been personally tried. When this is not the case, he frankly says so. The book, then, is not, like so many others on this subject, merely a long list of drugs said to be useful, till the reader finds them as dull as the genealogy of David and as dry as a prayer for rain.

It is interesting to note that in the treatment of acute rheumatism the author no longer uses either alkalies or sodium salicylate, but depends upon acetosalicylic acid and amidopyrin.

This is the best work on therapeutics that has appeared for many years.

Bright's Disease. J. Norman Cruickshank, M.C., M.D., D.Sc., F.R.F.P.S., M.R.C.P., Senior Assistant to Muirhead Professor of Medicine, University of Glasgow. 208 pages. Price $3.50. E. & S. Livingstone, Edinburgh; Macmillan Co., Toronto, 1933.

This book presents in a concise manner much of the valuable information that has resulted from recent investigations in the field of Bright's disease. As stated in the preface, its purpose is to provide an account of the clinical application of modern views of this disease. The clinical aspects are stressed, and lengthy theoretical discussions and detailed experimental procedures are avoided.

The term nephrosis is not limited, but is used in a general way, as Fahr does, to include all forms of degenerative Bright's disease. This takes in various toxic and chemical poisonings, as well as true lipoid nephrosis, amyloid and pregnancy nephroses. However, the author makes it clear that pure uncomplicated nephrosis is rare clinically, and that it is much more common to encounter the nephrotic syndrome in the course of either the inflammatory or vascular types. This he explains as the concurrence of degenerative changes in the renal epithelium, at the same time allowing himself a loophole in stating that "it is not clear, however, to what extent these degenerations of the kidney are of renal origin, and to what extent they are but expressions of a general disturbance of metabolism."

Chapter six dealing with the etiology of Bright's disease discusses the influence of various factors and serves to emphasize our ignorance concerning this phase of the disease. Twenty-eight pages are devoted to treatment and contain many practical suggestions. The latter half of the book deals with special features and notes on the classification. The chapter on œdema is well worth reading.

The beauty of the book lies in its brevity and the simple style of dealing with a subject concerning which there is at the present time such great diversity of opinion and still a great paucity of actual knowledge.

Diseases of the Chest and the Principles of Physical Diagnosis. G. W. Norris, A.B., M.D., Formerly Professor of Clinical Medicine, and H. R. M. Landis, A.B., M.D., Sc.D., Professor of Clinical Medicine, University of Pennsylvania. Fifth edition revised; 997 pages; illustrated. Price $11.00. W. B. Saunders, London and Phila.; McAinsh & Co., Toronto, 1933.

This very excellent and comprehensive treatise on diseases of the chest has, most deservedly, attained its fifth edition. A brief account of the bronchoscope and its part in diagnosis of respiratory infections by Dr. Louis H. Clerf is one of the chief additions. But one of the outstanding features of the book is its emphasis on the importance of methods of physical diagnosis. By the extent to which a man uses these will his clinical training be judged. There is a sense of satisfaction in seeing a careful and thorough examination of a chest which is the same as the pleasure derived from any skilled performance. Of course we know now that the x-ray will often augment our knowledge, but defective as our physical methods must be they are indispensable. All this is well brought out in this book. One only regrets that so many gross misprints should have been perpetuated from the last edition. A misprint in one edition may be allowed, but not in a succeeding "revised" edition; and when it is a matter of not one but twenty, then the proof reading can hardly have been taken very seriously. There is also the statement (p. 83) that the first rib articulates with the seventh cervical vertebra. That would make it a cervical rib.

A Text-Book of Gynæcology for Students and Practitioners. James Young, D.S.O., M.D., F.R.C.S.E., F.C.O.G., Gynæcologist, Royal Infirmary, Edinburgh, etc. Third edition; 411 pages; illustrated. Price $4.75. A. & C. Black, London; Macmillan Co., Toronto, 1933.

This, the third, edition of a work which was first published in 1921 has undergone a thorough revision so as to bring it into line with modern opinion. Throughout it bears the imprint of the clear thinking and logical presentation so characteristic of the Edinburgh school. The admittedly vexed question of menstruation is discussed in the light of recent investigations into the sex physiology of the lower animals, and due importance is given to the sex hormones of the ovary and of the pituitary gland. In dealing with sterility insufflation of the tubes and inflation with lipiodal are described and figured. There is a useful chapter on pain in gynæcology. The various theories of the causation of endometriomata are stated; Krukenberg and granulosa-cell tumours of the ovary are clearly described. Comparatively little space is given to operative procedures, but since there are numerous books on operative gynæcology the defect, if any, is a minor one. Altogether, the book may be heartily commended to the student or general practitioner.

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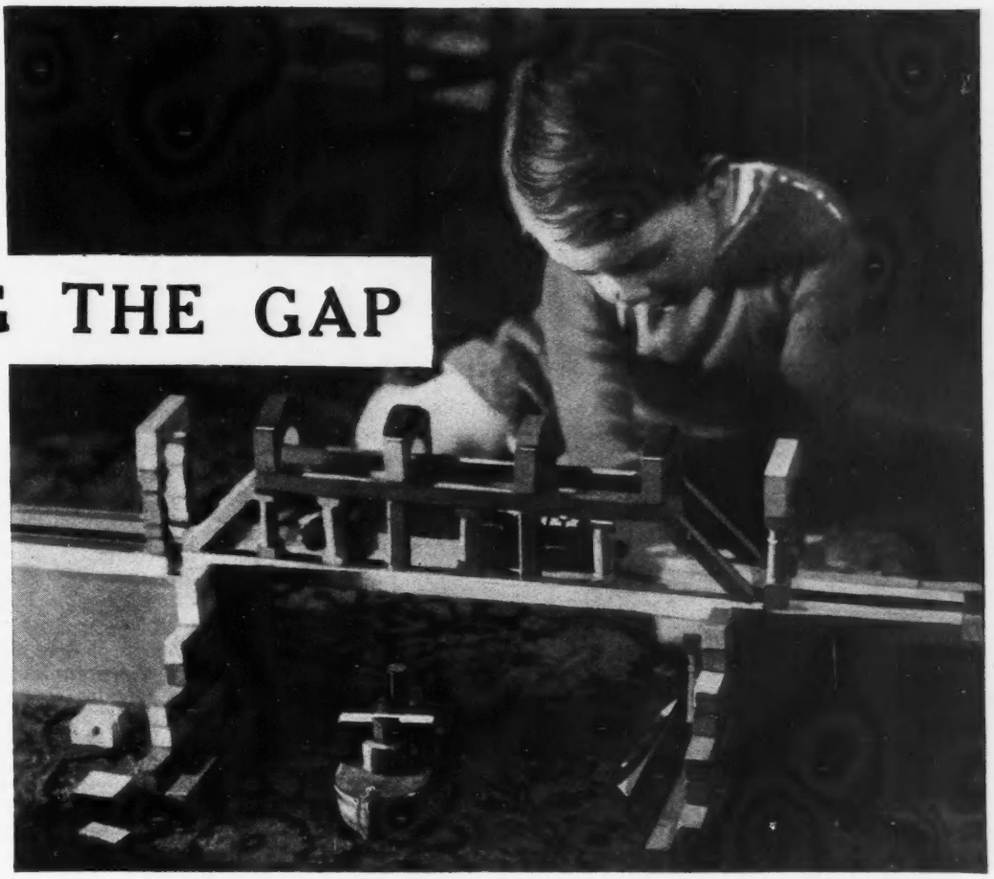

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Radiotherapy in the Diseases of Women. Malcolm Donaldson, B.A., F.R.C.S., M.B., B.Ch., Physician Accoucheur, St. Bartholomew's Hospital. 131 pages, illustrated. Price 7/6. Hodder & Stoughton, Ltd., London, 1933.

This book is written to give the general practitioner and the student an unbiassed opinion on the value of radiotherapy in gynæcology, where it finds its greatest field of usefulness. Although used widely in cancer, it is also useful in menopausal bleeding, in fibroids, and in tuberculous lesions.

The book is divided into three sections, the first of which deals briefly and concisely with the physics of x-ray and radium, the biological effects of gamma rays, and the 'dose and methods of applying radium. In the second section the cancer problem is discussed. Malignant disease of the cervix, fundus, vagina and vulva, their symptomatology and pathology, and finally methods of treatment are discussed. The various means of applying radium as carried out in 5 or 6 of the larger centres, and a statistical report of the results obtained are given. The third section deals with benign pelvic conditions which respond to radium and x-ray therapy, notably abnormal menopausal bleeding and fibroids, and when such treatment is to be recommended. The book closes with a chapter warning against over-radiation and its disastrous effects.

Nasal Accessory Sinuses. Frederick M. Law, M.D., Roentgenologist, Manhattan Eye, Ear and Throat Hospital, New York. 215 pages, illustrated. Price $10.00. Paul B. Hoeber, Inc., New York, 1933.

This book is a worthy companion to "Mastoids" by the same author. It is written by a radiologist who is also a clinicician in the subject. It is an interesting and readable treatise and well illustrated with photographs showing the posturing of the patient for radiology of the sinuses, and with numerous excellent plates of films showing normal and pathological findings. An interesting feature of the plates is the arrangement of material to show the appearance of the sinuses at all ages from one to eighteen. The author explains the necessity for team work between the radiologist and surgeon, and the text notes a number of examples illustrating the necessity for this. The book opens with an excellent chapter on the x-ray anatomy of the parts. Radiographic technique, interpretation, and diagnosis are thoroughly and efficiently covered. The book is a good source of study for the radiologist and the surgeon.

The Great Doctors, a Biographical History of Medicine. Henry E. Sigerist, Professor of History of Medicine, Johns Hopkins University. Tr. by Eden and Cedar Paul. 436 pages, illustrated. Price $4.00. W. W. Norton & Co., New York, 1933.

Even more interesting than his recent "Man and Medicine", in which the author dealt with the various aspects of modern medicine and traced them back to their origins, the present book portrays chronologically the lives, and especially the work, of our leaders. It is a good method of presenting history, especially in the hands of a master like Dr. Sigerist. If anyone doubts it, let him read this book and be convinced. There are 48 chapters, each headed by a name, or sometimes the names of a pair of related or contrasted contemporaries, 58 Great Doctors in all. Our mythical founders, Imhotep and Æsculapius, are appropriately introduced with the formula "Once upon a time", and an excellent chapter on the Father of Medicine is justly summed up in the sentence, "All that we certainly know of Hippocrates is that he lived, and yet no doctor ever exerted a more far-reaching influence than he." With Diocles, Heraclides, Asclepiades, Constantinus, and Peter of Abano, among the fourteen "headliners" prior to the Renaissance, this is no conventional history but a product of modern professional research. Among so many good sketches of the later men it is difficult to pick and choose, but particularly animated is the "close-up" of the doughty Swiss fighter, Paracelsus, seen through the telescope of a fellow-countryman who has worked on him with Sudhoff. If the modern period is, inevitably, crowded with Continental figures, all the greatest Englishmen are here. Not so the Americans. They were entirely neglected in the first German edition. In the second, from which this excellent translation has been made, some justice has been done them in an additional chapter which bears Osler's name and is introduced by a summary of American achievements. (Now that Dr. Sigerist is established in Baltimore, the history of medicine in America will soon be in his debt). A good case is made out for Osler's right to a place in this galaxy. His renown, like Boerhaave's with whom he is aptly compared, depends not on outstanding discoveries, but on "his personality as physician, teacher, and man." A good book, rounded off with a good bibliography.

Industrial Health Service. Leverett Dale Bristol, M.D., Dr.P.H., Health Director, American Telephone & Telegraph Company, New York City. 170 pages. Price $2.00. Lea & Febiger, Phila., 1933.

As Health Director of the American Telephone & Telegraph Company, Doctor Bristol has had extensive experience in the organization and administration of the Industrial Health Service, and more particularly in the methods of health education directed toward industrial employees. In "Industrial Health Service", he has given us briefly, clearly and concisely, the benefit of this experience in organization and teaching.

The book is divided into three parts: First, Industrial Health Service from the Standpoint of Management; second, Industrial Health Service from the Standpoint of the Supervisor, and, finally, Industrial Health Service from the Standpoint of the Individual Worker.

The first part is addressed, in part, to industrial managers, and carefully advances the reasons why health supervision of employees should be provided. At the same time it points out what the management is entitled to expect from its medical department, and thus serves as a suitable text for those physicians engaged in the organization of departments of this type. An interesting feature of the book is the setting forth in two appendices of an appraisal form to evaluate numerically the quality of the medical service rendered, and, in the case of large industries, the quality of industrial relations service in general. This scheme follows the appraisal practices of the American Public Health Association.

The second part of the book is addressed more particularly to those holding supervisory positions in industry, and here again we have an original idea which Doctor Bristol has worked out in his own company. Briefly, it is the system of training supervisors to have a knowledge of health above that of the average person, and to use this knowledge in the detection of cases among their workers who should have medical attention. They are taught the requirements of good ventilation; it is made their responsibility to point out to those suffering from very apparent minor defects (skin lesions, bad teeth and the like) the necessity for correction, and, finally, they are supposed to know something of the causes of unsatisfactory mental adjustment to work, chronic absenteeism and frequent use of the rest-rooms, and to take appropriate steps to bring such workers to those who can aid them.

Part three is a course in personal hygiene for the individual worker. It is largely taken from material prepared for the health education of the employees of the American Telephone & Telegraph Company, and covers in simple language such subjects as the value of the periodic health examination, the selection of a physician, diet, the control of weight, ventilation, the avoidance of the external health hazards of summer

Radiograph (after ingestion of a barium meal) showing a typical case of diverticulosis.

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and winter, and special job hazards. A valuable bit is the short chapter on appendicitis, with its warning to avoid the use of cathartics and to seek immediate medical advice in the presence of abdominal pain not promptly relieved.

Maternal Mortality in New York City. A study of all puerperal deaths, 1930-1932, by the New York Academy of Medicine Committee on Public Health Relations. Ransom S. Hooker, M.D., F.A.C.S., Director of the Study. 290 pages. Price $2.00. The Commonwealth Fund, New York, 1933.

The New York Academy of Medicine, through a special committee and with the financial assistance of the Commonwealth Fund, have made a most valuable contribution to an understanding of why maternal deaths occur. This is not a study of maternal mortality rates, but is a careful review of every death in order to learn why death occurred, and further, to determine if death might have been prevented.

The committee find that 1,343, or 65.8 per cent, of the deaths were preventable. Keeping in mind that this is a study made by the medical profession, it is of particular significance to find that to the medical profession are charged 61.1 per cent of all the preventable deaths. Of the remainder, 36.7 per cent are charged to the patient, and 2.2 per cent to the midwife. The 61.1 per cent were due to "lack of judgment, lack of skill, or careless inattention to the demands of the case. Some of these situations have arisen out of the fact that interns have been given too wide a field of independent activity. Most are plainly the results of incompetence."

Consideration is given to the wider use of anæsthetics and to the increase in abortions. The steady increase in operative deliveries means that one out of five deliveries is operative, the death rate for spontaneous deliveries being less than one-fifth of that of the operative group. Cæsarean section was the method of delivery for 2.2 per cent of all cases, and was responsible for approximately 15 per cent of all deaths. The highest death rate is for the slum population, and the lowest for the most favourably situated economic group.

The report is a courageous facing of facts. There is no dodging the issue that "Responsibility rests with the medical profession". The committee do not view this responsibility in a narrow way, but regard it as a general obligation to instruct the public, thus taking over a rôle which was formerly left to lay organizations, to study the needs and to provide better care. Every practitioner of medicine should read this study, and consider what its implications are for himself and for his community.

The Lyophilic Colloids. Martin H. Fischer, Professor of Physiology, University of Cincinnati, and Marian O. Hooker, Research Associate in Physiology. 246 pp.; illustrated. Price $4.50. C. C. Thomas, Springfield and Baltimore, 1933.

For many years Fischer has stubbornly defended a series of somewhat heretical opinions concerning the colloidal state of living matter, and in this book he recapitulates his views with some new evidence in their favour. He believes, for instance, that there is no "membrane" around the living cell, and hence that osmotic phenomena hardly come into play; that living matter consists of water dissolved in protein, etc., rather than the converse; that proteins form specific compounds with acids; that these compounds are capable of holding rather large amounts of water in solution, and hence acidosis produces œdema. His theories are by no means ludicrous, and this book may be a valuable corrective to those who accept the prevailing views too blindly as dogma; but it can hardly be recommended to readers unfamiliar with the subject. The authors are content to state their own case without attacking the more widely accepted teaching explicitly, and certainly without reference to the successes of that teaching in the treatment of various practical problems, including those dealt with in the present work.

Neuroanatomy: A guide for the study of the form and internal structure of the brain and spinal cord. J. H. Globus, B.S., M.D., Associate Professor of Neuropathology and Neuroanatomy, New York University. Sixth edition, 240 pages, illustrated. Price $3.50. William Wood & Co., Baltimore, 1934.

This book is intended for use in a course of human brain dissection, and is divided into two parts.

Part 1 is descriptive of the steps to be followed in a dissection and, for this purpose, is divided into 23 segments, each containing work to occupy a three-hour laboratory period. A brief sketch of development is followed by a general description of the surface appearance of the brain. The meninges, cerebrospinal fluid pathways and vascular channels are adequately dealt with. The gross structures of the brain and spinal cord are then described systematically. Nine segments are devoted to the internal structure of the brain-stem, and the last laboratory period is used for a study of the cerebral and cerebellar cortices. This part is illustrated by 36 figures, including a number of excellent photomicrographs of Weigert-stained sections of the spinal cord and the brain-stem at different levels.

Part 2 consists of 53 uncompleted line drawings, which can be detached from the book and filled in by the student, thus giving him a permanent record of his dissection. Some of these plates have drawings of the brain-stem in series, so that the course of the important nerve-tracts through the nervous system can be filled.

The author intends the book to be used to supplement one of the standard text-books dealing with the subject, and therefore he presumes considerable knowledge acquired elsewhere. The internal structure of the brain-stem is somewhat overstressed from the view-point of the average medical student.

This volume should prove especially valuable to a student who has some preliminary acquaintance with the anatomy of the brain and is desirous of acquiring a good working knowledge of the internal structure of the nervous system.

Rheumatism in General Practice. Matthew B. Ray, D.S.O., M.D., Senior Physician, British Red Cross Clinic for Rheumatism. 404 pages. Price 16s. H. K. Lewis, London, 1934.

This book is a presentation of the salient features of those conditions which are usually regarded as belonging to the group of rheumatic diseases. The work is divided into two parts, the first being devoted to a general consideration of the etiology, clinical features, diagnosis and treatment of these affections, while the second deals more particularly with their local manifestations in various regions of the body.

In Part I the author devotes chapters to acute articular rheumatism, including chorea, fibrositic affections, metastatic arthritis, rheumatoid arthritis, gout and metabolic arthritis, osteo-arthritis, and finally the physical treatment of rheumatic disease. The subjects are presented concisely, clearly, and with ample reference to the more important literature. Not the least interesting and instructive are the chapters on physical treatment. Here are recorded details of various procedures known and practised by every physio-therapist, but perhaps as nebulous to the general practitioner as they were to the reviewer.

In Part II the subject is dealt with from a different angle. The various joints are taken up one by one, and the diseases to which they are liable are discussed with particular reference to the joint concerned. One of the most interesting chapters is devoted to the affections of the trunk and spine.

The book is an excellent presentation of this most interesting and important subject.